 Developing contexts in learning units

Contexts in Science

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In developing teaching and learning programs, teachers choose contexts to assist students make meaning of and integrate the content. Appropriate contexts can encourage students to further develop their understanding of science as a distinct view and way of thinking about the natural world. In additional, contextualised unit of works facilitate the incorporation of cross-curriculum priorities and general capabilities. Well-chosen contexts also assist in emphasising content through which students’ understanding about science as a human endeavour and its nature and practice are developed.

In planning units of work the choice of contexts allows teachers to take into account the intellectual, social and emotional development of their students The syllabus does not specify the contexts as the choice of these will depend upon teacher judgement of what best meets the students’ interests, the school and the community culture.

Contexts can be drawn from a wide range of areas and the success of the chosen context will depend upon a number of factors, including the student’s social values, world views, language and cultural background.

A variety of well-chosen contexts across the school program increases the opportunity for students to be active participants in the learning process. Through the choice of relevant and appropriate broad contexts and the associated learning experiences students’ thinking and problem-solving skills can be enhanced. Similarly, through the network of contexts within each unit of work, students increase their understanding of science concepts and how these are applied in real-world situations relevant to their lives.

Sourcing contexts

Within the teaching and learning program, the context provides the framework that is used to make meaning of the selected values and attitude outcomes, knowledge, and Working Scientifically content.

The local environment

Contexts derived from the local environment could include aspects of the local geographic location and/or involve local community issues. A Stage 5 unit of work developed to cover the wave model may look distinctly different for a school situated on the coast compared to a school situated in an inland rural area. A teacher at a coastal school may develop a context around science concepts involved in conducting a surfing competition, whereas a teacher at an inland school may develop a context involving investigations in communication over large distances.

Past and recent geological events may also provide local-specific contexts for teachers developing a Stage 4 unit of work covering the atmosphere, the hydrosphere and the lithosphere. Contexts could be developed involving investigations into the type and origin of local soils, Indigenous and non-Indigenous land and water management practices, weathering and erosion.

Choosing contexts based on local community issues gives teachers the opportunity to draw on businesses and local industries, community group activities and significant local events, both recent and historical. A country or regional centre may have agricultural industries involved in the trialling of genetically modified crops, providing a possible context for a Stage 5 unit which includes genes and DNA. Another centre may be located in proximity to a major electrical power supplier, providing the basis for a Stage 4 unit on natural resources and technology.

The global environment

A key feature of contexts involving global events and issues is their dynamic nature. Teachers developing and utilising these contexts can modify areas of investigation to reflect new discoveries, scientific theories and debates, environmental issues and current affairs. A Stage 5 unit using sustainability for the future as the context could contain learning/teaching activities utilising content from current research, social and political commentary on scientific evidence for climatic anomalies and changes to the biosphere.

Drawing contexts from global events and issues also assists teachers in developing teaching and learning strategies that combine prescribed focus area and skill outcomes. Units of work based on the global environment may be strongly focused on content from the working scientifically skills of research and reporting not only on the underlying science concepts but also on personal and societal impacts.

Student experience

The student experience encompasses both everyday experiences and the school and community culture. When considering the school culture in choosing and developing contexts, teachers may incorporate aspects of a school’s curricular and extra-curricular activities. Schools often provide a diverse range of these activities from which contexts may be chosen and developed. A school noted for sporting achievements may use a context surrounding fitness and health when developing a unit of work covering humans; a school that participates in rock eisteddfods and/or theatre may use a context investigating energy concepts and use when conducting such productions.

Contexts can also be drawn from students’ everyday exposure to popular print and multimedia entertainment. A context that involves investigating the science in fantasy stories or science fiction and/or movies could be developed for either Stage 4 or Stage 5. A Stage 4 unit may incorporate learning activities where students design a ‘superhero’ based on energy changes and forces in action where a Stage 5 unit may have activities where students investigate the science in scenarios involving DNA, natural selection or technology.

Teacher interests

Teachers, like their students, bring prior experience to the classroom which can be drawn upon to assist in the choice of context. Knowledge gained from life experiences in work, travel and recreational interests can contribute to the development of a contextual-based learning unit.

A teacher with experience in orienteering, bushwalking or rock-climbing could develop a teaching program using a context of adventure travel within Australia that may include student research and/or investigation on fabrics best suited to varying climatic conditions, food requirements, terrain mapping and safety. A teacher with travel experiences may develop a context on ecotourism within or outside Australia that allows students to research and plan their own eco-tour.

Choosing a context based on personal experience allows a teacher to utilise their background knowledge of real-life applications and implications of scientific concepts. In this way, a teacher’s own scientific literacy is a major contributor to the teaching program and classroom experience of the students.

Narratives and timelines

Storytelling and the use of narrative has a strong research base in its impact on student engagement with and understanding of science. In choosing a narrative as a context for a unit of work, teachers could begin with major historical events or periods in which science and scientists had a significant impact. The role of science may not be immediately evident to the students and the more effective narratives are those that allow the teacher to ‘reveal’ the science concepts at work.

An effective narrative is more than a simple biography of a scientist or description of the development of an invention. A Stage 4 unit developed around the history of refrigeration and/or air-conditioning could include examples of their impact on people’s personal experiences with living in harsh climates and the problems of keeping food fresh. A Stage 5 unit on infectious and non-infectious disease could include narratives on examples where scientific ideas had struggled for acceptance. Investigating the historical and social contexts of scientists’ work introduces students to the complex interaction between human behaviour and scientific endeavour.

Constructing timelines of scientific and technological developments can introduce students to elements of the history of science. A context with some historical focus should expand on simply listing dates and names to providing students with opportunities to make links between key science ideas and discoveries and the resultant impact on society.

A context for a Stage 4 unit on the Newtonian model of the solar system may also have students conducting research into pre-Newtonian ideas from a number of cultures including non-Western and Indigenous. Using a context concerning the application of nuclear energy could include student construction of a timeline for the development of the atomic model focusing on scientists’ use of evidence to construct atomic models.

Science inquiry

Choosing contexts that focus on science inquiry provides opportunities for students to participate in the design of their learning experiences. This can be effective in increasing and maintaining motivation provided the unit delivers its promise. Hands-on practical experiences in which students engage in creative problem-solving processes where they pose their own questions, plan and conduct the investigations, collect and analyse evidence and communicate their understanding develop their understanding about scientific inquiry. Where the students are involved in the design of all or part of the unit, the teacher must have a clear overview of the intended targeted outcomes. Different teams or groups in the class would develop their understanding of the scientific knowledge, understanding and skills outcomes and content targeted in the unit in relation to different aspects of the general context.

While the students may be given the freedom to steer the content and contextual material in the direction of their choice the teacher still maintains the pivotal role in facilitating the learning process to enhance students’ capabilities to learn how to learn science through inquiry. Self-directed learning through inquiry within an aspect of the general context of the unit of work that is of interest and significance to them provides students with the opportunity to gain a deeper understanding of the scientific concepts and how these relate to their world. In consolidating the unit teachers would support the students in recognising that the science content they are trying to understand is relevant to a greater number of situations than just in the immediate aspect of the context they considered. They would also gain greater awareness and understanding of the general context and its applications and implications for society and the environment in the real world.