PULSE@Parkes in the Curriculum

PULSE@Parkes https://research.csiro.au/pulseatparkes/ uses the context of pulsars and radio astronomy to engage and challenge students.

As the program is targeted at students in Years 10 -12, the following content descriptors from the Year 10 Science Curriculum https://www.australiancurriculum.edu.au/f-10-curriculum/science/ and the Year 11-12 Physics Curriculum https://www.australiancurriculum.edu.au/senior-secondary-curriculum/science/physics/ provide guidance as to what can be addressed through participation in PULSE@Parkes:

Stage 5 Science

Science Understanding

Earth and Space Science:

- The universe contains features including galaxies, stars and solar systems, and the Big Bang theory can be used to explain the origin of the universe (ACSSU188)

Science as a Human Endeavor

Nature and development of science:

- Scientific understanding, including models and theories, is contestable and is refined over time through a process of review by the scientific community (ACSHE191)
- Advances in scientific understanding often rely on technological advances and are often linked to scientific discoveries (ACSHE192)

Use and influence of science:

- People use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people's lives, including generating new career opportunities (ACSHE194)

Science Inquiry Skills

Planning and conducting:

- Select and use appropriate equipment, including digital technologies, to collect and record data systematically and accurately (ACSIS200)

Processing and analysing data and information:

- Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS203)
- Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS204)

Evaluating:

- Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS205)

Communicating:

- Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS208)

Stage 6 Physics

Unit 2: Linear Motion and Waves

Science Inquiry Skills

- Science is a global enterprise that relies on clear communication, international conventions, peer review and reproducibility (ACSPH053)
- Select, use and interpret appropriate mathematical representations, including linear and non-linear graphs and algebraic relationships representing physical systems, to solve problems and make predictions (ACSPH051)

Science as a Human Endeavour

- Science is a global enterprise that relies on clear communication, international conventions, peer review and reproducibility (ACSPH053)
- Development of complex models and/or theories often requires a wide range of evidence from multiple individuals and across disciplines (ACSPH054)
- Advances in science understanding in one field can influence other areas of science, technology and engineering (ACSPH055)

Science Understanding

- predictions, except when considering objects travelling at or near the speed of light, or very small objects like atoms or subatomic particles, or when very strong gravitational fields are involved (ACSPH058).
- Later, in the 1860s, James Clerk Maxwell developed a theory of electromagnetism and showed that electromagnetic waves would travel through space at the speed of light, implying light was an electromagnetic wave (ACSPH054).
- Light exhibits many wave properties; however, it cannot be modelled as a mechanical wave because it can travel through a vacuum (ACSPH074)
- A ray model of light may be used to describe reflection, refraction and image formation from lenses and mirrors (ACSPH075)
- A wave model explains a wide range of light-related phenomena including reflection, refraction, total internal reflection, dispersion, diffraction and interference; a transverse wave model is required to explain polarisation (ACSPH076)
- The speed of light is finite and many orders of magnitude greater than the speed of mechanical waves (for example, sound and water waves); its intensity decreases in an inverse square relationship with distance from a point source (ACSPH077)

Unit 3: Gravity and electromagnetism

Science Inquiry Skills

- Represent data in meaningful and useful ways, including using appropriate SI units, symbols and significant figures; organise and analyse data to identify trends, patterns and relationships; identify sources of uncertainty and techniques to minimise these uncertainties; utilise uncertainty and percentage uncertainty to determine the uncertainty in the result of calculations, and evaluate the impact of measurement uncertainty on experimental results; and select, synthesise and use evidence to make and justify conclusions (ACSPH081)
- Select, use and interpret appropriate mathematical representations, including linear and non-linear graphs and algebraic relationships representing physical systems, to solve problems and make predictions (ACSPH084)

Science as a Human Endeavour

- ICT and other technologies have dramatically increased the size, accuracy and geographic and temporal scope of datasets with which scientists work (ACSPH086)
- Models and theories are contested and refined or replaced when new evidence challenges them, or when a new model or theory has greater explanatory power (ACSPH087)
- Science can be limited in its ability to provide definitive answers to public debate; there may be insufficient reliable data available, or interpretation of the data may be open to question (ACSPH090)

- International collaboration is often required when investing in large-scale science projects or addressing issues for the Asia-Pacific region (ACSPH091)

Science Understanding

Gravity and Motion

- All objects with mass attract one another with a gravitational force; the magnitude of this force can be calculated using Newton's Law of Universal Gravitation (ACSPH094)
- Objects with mass produce a gravitational field in the space that surrounds them; field theory attributes the gravitational force on an object to the presence of a gravitational field (ACSPH095)

Other subject possibilities

PULSE@Parkes lends itself to forming the core of a Depth Study as required in the NSW Stage 6 Physics syllabus, the Stage 6 Investigating Science syllabus, open-ended investigations in Stage 5 and the Extended Essay for the International Baccalaureate. Please contact our team if interested in exploring options.

More details:

https://research.csiro.au/pulseatparkes/

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