CubeSats Project

Big Idea: Satellite technology and remote sensing has changed the way we study our planet and provides evidence-based data for decision-making. CubeSats allow this technology to be brought into the STEM educational environment.

Australian Curriculum	**Key Concepts**	**Learning Targets:** **Students should know and understand**	**Behavioural Objectives:** **Students should be able to do**
Advances in science and emerging sciences and technologies can significantly affect people's lives, including generating new career opportunities (ACSHE158/192)	1. The miniaturisation of satellites such as CubeSat provides new access to space technologies for a wide range of applications at a significantly reduced cost.	1.1 Miniaturized satellites for space research, such as CubeSats, are of small size and mass and use commercial off-the-shelf components for its electronics and sensors. 1.2 Satellites are used for a range of functions such as monitoring land use, and can carry a range of payloads including cameras and GPS and how it can help our lives and the community	1.1.1 Research the features of a CubeSat 1.1.2 Compare the similarities and differences of a CubeSat and conventional satellites 1.2.1 Investigate the principles of GPS 1.2.2 Understand the specifications of the GPS and camera 1.2.3 Evaluate the payload components for the CubeSat
The values and needs of contemporary society can influence the focus of scientific research (ACSHE228/230))	2. The principles of satellite design needs to take into account the nature and purpose of the mission. The use of concurrent design system engineering allows multiple design elements to occur at the same time.	2.1 Concurrent design allows development of satellite components simultaneously and collaboratively 2.2 The engineering and scientific tasks to be developed for launch	2.2.1 Negotiate conflicting engineering and science objectives and requirements 2.2.2 Develop appropriate engineering tasks that identify the elements required to allow the successful launch and flight of the CubeSat 2.2.3 Identify possible experiments of the scientific payload, using the constraints of the available equipment.

Plan, select and use appropriate investigation methods, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods (ACSIS165/199)	3. A question can be answered using a scientific process. Solving problems requires activities such as planning a course of action, collecting data, interpreting data, reaching a conclusion and communicating these activities.	3.1 Develop collaborative skills to design the extended investigation. 3.2 Communicate the design solutions to other groups	3.2.1 Use collaborative skills to identify and design the engineering components, for example: • Weather conditions analysis • the calculation of flight path • balloon parameters such as the required volume of helium, • calculation of data storage space, for example for video and gps storage • data synchronisation of gps with camera data • battery power of GPS camera 3.2.2 Use collaborative skills to identify and design the scientific payload components • taking into the account the limitations of camera, which lead to the type of experiment possible • e.g. Curvature of earth for horizontal orientation, or remote sensing activity for vertical orientation • temperature vs height 3.2.3 Prepare report on experimental findings 3.2.4 Present report to other groups
	4. Satellite technology has a testing process to minimise risk of launch failure and	4.1 Before a satellite can be launched it has to go through a number of procedures for approval for space	4.2.1 Design and implement testing of the parachute to investigate reliability and performance on deployment

	ensure reliability of components.	flight. 4.2 Space qualification is the formal proof that the design meets all requirements of the specification of the mission.	4.2.2 Design and testing of electronics 4.2.3 Design and testing of batteries of camera
Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS169/203)	5. Analysing data in order to reach a conclusion is the foundation of scientific method.	5.1 Data can be analysed and compared with other experimental results to identify trends, draw conclusions and to identify discrepancies in the data.	5.1.1 Analyse the data from curvature of earth photos 5.1.2 Calculate and graph distance to horizon at different altitudes 5.1.3 Analyse the data from 'down pointing' camera to plot the path of balloon and investigate land use under the balloon path.
Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS171/205)	6. Explanations based on experimental evidence allow predictions to be more reliable.	6.1 The strength of a conclusion is evaluated from a particular set of data and recommendations based on the experimental evidence and identifying sources of uncertainty in the data.	6.1.1 Evaluate conclusions, including the accuracy of measurements and sources of error. 6.1.2 Give examples of how the experimental design can be improved 6.1.3 Use a graphic organiser to effectively communicate the results