Sample STEM Technologies Unit: It's Not Just Wind — Year 6

Unit Overview

Design & Tech.

Students will explore the process of innovation by focusing on the technologies we use to generate a sustainable source of electricity (ACTDEK020), as part of *Innovation Experience* (Ian Potter Foundation Technology Learning Centre, IPFTLC). They will engage in:

- hands-on prototyping activity to demonstrate movement to generate electricity,
- guided assembly, including use of plastic fabrication equipment, to explore options to develop a prototype,
- digital prototyping session to explore their understanding of how the movement of fluid generates power.

Digital Tech.

Students plan and manage a digital project to create a simulation showing how a wind generator is used to supply power. They collect data sourced from a digital prototype that models a range of wind conditions that allow a wind generator to operate effectively (TLF ID L49). Using this data, students will use spreadsheet and animation software to interpret and visualise data to create information (ACTDIP016).

Applying social and ethical protocols and practices: Manage ideas/ information in online space *(General Capabilities: ICT)*

Inquiry focus question

Structured	How can people use environments more sustainably?
Core	How can technology be used to promote environmentally sustainable approaches in your community?
Extension	How do different views about the environment influence approaches to sustainable technologies?
Cross-curricular: HaSS	*How has Australia developed as a society with global connections, and what is my role as a global citizen?*

Achievement Standard

Design and Technologies

By the end of Year 6, students describe competing considerations in the design of products, services and environments, taking into account sustainability. They describe how design and technologies contribute to meeting present and future needs. Students explain how the features of technologies impact on designed solutions for each of the prescribed technologies contexts.

Students create designed solutions for each of the prescribed technologies contexts suitable for identified needs or opportunities. They suggest criteria for success, including sustainability considerations, and use these to evaluate their ideas and designed solutions. They combine design ideas and communicate these to audiences using graphical representation techniques and technical terms. Students record project plans including production processes. They select and use appropriate technologies and techniques correctly and safely to produce designed solutions.

Digital Technologies — **Specialist Programme**

By the end of Year 6, students explain the fundamentals of digital system components (hardware, software and networks) and how digital systems are connected to form networks. They explain how digital systems use whole numbers as a basis for representing a variety of data types.

Students define problems in terms of data and functional requirements and design solutions by developing algorithms to address the problems. They incorporate decision-making, repetition and user interface design into their designs and implement their digital solutions, including a visual program. They explain how information systems and their solutions meet needs and consider sustainability. Students manage the creation and communication of ideas and information in collaborative digital projects using validated data and agreed protocols.

Assessment Focus

Knowledge and Understanding			
Technologies and society ACTDEK019	I can identify ways people address competing considerations when designing products, services and environments, including sustainability for current and future use.	Digital systems ACTDIK014	I can explain how digital systems have components that follow functions and interactions to form networks to transmit different types of data.
Engineering principles and systems ACTDEK020	I can explain how electrical energy and forces can control movement, sound or light in a product or system.	Representations of data ACTDIP016	I can collect, sort, interpret and visually present different types of data using software to manipulate data for a range of purposes.
Processes and Production skills			
Investigating and defining ACTDEP024	I can define a problem, and set of sequenced steps, to create a solution for a given task.	Investigating and defining ACTDIP017	I can define a problem, and set of sequenced steps, with users making a decision to create a solution for a given task.
Generating and designing ACTDEP025	I can record specifications made in my design task, using appropriate technical terms.	Production and implementation ACTDIP020	I can implement and use simple visual programming environments that include branching (decisions), iteration (repetition) and user input.
Secondary outcomes: ACTDEP026, ACTDEP027, ACTDEP028		Secondary outcomes: ACTDIP016, ACTDIP018, ACTDIP019, ACTDIP021, ACTDIP022	

Planner

Wk.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Focus		IPFTLC		Investigating engineering principles and systems					Exploring information systems				Collecting and managing data				Creating data-based solution			
Outcomes		ACTDEK020		ACTDEP024, ACTDEP025					ACTDIK014, ACTDIP016				ACTDIP017				ACTDIP020			

Unit evaluation

QT Focus	Reflection	Future planning notes:

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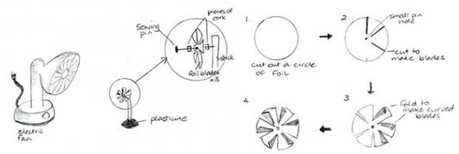
Design and Technology

Phase	Learning/ Teaching (Core)	Differentiation: Structured	Differentiation: Extension
	Note: Initial project built prior to starting unit.		
	Investigate: Explore electrical energy in designs ▪ Brainstorm arrange of devices and systems that use electrical energy. ▪ Explain the benefits of being able to control movement, light or sound with electrical energy.		
	Generate: Evaluate needs/ opportunities **Design challenge:** Re-evaluate wind turbine prototype produced (IPFTLC excursion) to improve on its efficiency to capture kinetic energy from the wind. ▪ Identify different engineered solutions that build upon IPFTLC excursion.  	Supported journal entries, including labelled sketches/ photographs of design project.	Extended journal entry responses to demonstrate efficiency results of blades, including information that identifies and evaluates the improvements made to blades of at least two successive attempts.
	(Re)Produce: Investigate competing factors ▪ Identify factors designers have to consider when developing a designed solution to improve efficiency. ▪ Link factors to identified need in order to evaluate importance of different factors on designs.		
	Evaluate: Investigate competing factors ▪ Identify which factors are the most important when designing or using an electrical device or system. ▪ Analyse designed solutions to assess the influence of different factors on designs. ▪ Consider how compromising on decisions impacts on the final design or product.		Select one renewable resource and defend its continued development to present to IPFTLC educators, taking into account economic, social and environmental considerations.
	Collaborate/ Project Management: Solution Learning opportunities: ▪ Identify how and why designers create prototypes of their designs. ▪ Evaluate student amendments to production plan, including modification notes and documented sequence of production steps. ▪ Negotiate criteria for success to evaluate design challenge.		Produce diagram to show the transformation of energy from kinetic to electric, including any inefficiencies (waste) – with assistance from IPFTLC educators.

Digital Technology

Phase	Learning/ Teaching (Core)	Differentiation: Structured	Differentiation: Extension
	Investigate: System thinking ▪ Use *Minecraft EDU* to introduce concept of systems thinking; students create individual mind map to: describe scenario, and identify game components.		
	Investigate: Information system (components) ▪ Discuss how information systems have been created to solve specific problems (e.g. a GPS mapping app); use systems thinking to break it into its components ▪ Create an annotated diagram to explain: - How data is entered, - Where data is stored, - How users interact with the system.	Support investigation of system components, such as: hardware, software, users, data collection methods, etc.	Extend response with the use of flow chart to map user interactions with systems.
	Generate: Collect and evaluate data ▪ Experiment with using information systems to retrieve data (TLF ID L49). ▪ Discuss ways of collecting data, such as surveys, experiments, interviews and crowdsourcing. Explore ways information systems have collected data.	Provide a more focussed set of data to analyse.	Determine conditions/ resources required to collect this data from wind turbines product at IPFTLC (connect with specialist teacher: ADHS, IPDTCL).
	Generate: Interpret/ visualise data ▪ Experiment with managing and validating data, using a spreadsheet, to create different types of tables/ graphs to display and compare results. ▪ Explore how information systems visualise data to create information, e.g. mapping, infographics, graphs, diagrams and tables.		Conduct wind turbine modelling to collect data.
	Produce: Design user interface ▪ Create an annotated diagram of an existing user interface. Label the major features and identify input and output. ▪ Discuss user interface features that reduce errors in user input, e.g. clear instructions, drop down menus of valid choices etc.	Provide sample of design user interface to use; focus on changing visual elements, e.g. font, colour	
	Produce: Interactive spreadsheet ▪ Use spreadsheet software to implement decisions and user input in an interactive spreadsheet, e.g. looking up categories of data that match user input.	Directed learning to observe input/ outputs of an existing spreadsheet, e.g. explanation of the cause and effect	
	Evaluate/ Collaborate/ Project Management ▪ Conduct a collaborative project to design and implement an interactive spreadsheet.		Students make contact with specialist/ computer programmer to develop infographic using code.