Government of **Western Australia**
School Curriculum and Standards Authority

SAMPLE TEACHING AND LEARNING OUTLINE

TECHNOLOGIES

DESIGN AND TECHNOLOGIES: ENGINEERING PRINCIPLES AND SYSTEMS

YEAR 6

2019/50688v3 [PDF 2020/33419]

This document is an introduction to planning a teaching and learning outline with syllabus content for Year 6 Design and Technologies: Engineering principles and systems context. It provides suggested sequencing and timing for teaching the syllabus content, giving students the opportunity to study at least one of the contexts for Design and Technologies. For further details on curriculum requirements and available options, teachers should refer to the School Curriculum and Standards Authority's (the Authority's):

- *Policy Standards for Pre-primary to Year 10: Teaching, Assessing and Reporting*
- Table 1: *Western Australian Curriculum and Assessment Outline*: curriculum requirements and available options.

Schools may choose to teach the syllabus content for two hours per week for a semester, **or** one hour per week for the year. Sample plans provide a range of possible learning experiences from which assessment should be drawn. This *Year 6 Sample Teaching and Learning Outline* provides teachers with possible learning experiences over 16 weeks and unpacks the syllabus content to support teachers in their understanding.

A presentation (*Western Australian Curriculum Technologies Presentation*), which unpacks the process to develop this plan, is available on the Presentations page of the Authority website (https://k10outline.scsa.wa.edu.au/home/resources/presentations).

Year 6 Syllabus Content – Design and Technologies: Engineering principles and systems context

Content	Description
Technologies and society	How people address competing considerations, including sustainability when designing products, services and environments for current and future use
Engineering principles and systems	Electrical energy and forces can control movement, sound or light in a product or system
Investigating and defining	Define a problem, and set of sequenced steps, with users making decisions to create a solution for a given task Identify available resources
Designing	Design, modify, follow and represent both diagrammatically, and in written text, alternative solutions using a range of techniques, appropriate technical terms and technology
Producing and implementing	Select, and apply, safe procedures when using a variety of components and equipment to make solutions
Evaluating	Develop collaborative criteria to evaluate and justify design processes and solutions
Collaborating and managing	Work independently, or collaboratively when required, considering resources and safety, to plan, develop and communicate ideas and information for solutions

Year Level Description

Learning in Design and Technologies builds on the range of concepts, skills and processes developed in previous years.

In Year 6, students have opportunities to learn about technologies in society through different technology contexts as they create solutions in at least one of the following technologies contexts: Engineering principles and systems; Food and fibre production; Food specialisations; and Materials and technologies specialisations. Students are provided with opportunities to produce products and develop an understanding that designs for services and environments meet community needs.

Students have the opportunity to begin to critically examine technologies, including materials, systems, components, tools and equipment that are used regularly in the home and wider community. They explore and begin to consider ethical points of view, social impact and environmentally sustainable factors when developing design solutions. Students examine why and for whom technologies are developed.

Students have opportunities to engage with ideas beyond the familiar, exploring how people working in a range of technologies contexts contribute to society. They continue to build on design capabilities through broadening their own design ideas used in solutions. Students have opportunities to explore trends and data to predict what the future will be like, and suggest design decisions that contribute positively to preferred futures.

Using technologies to suit the purpose, students explore how to represent objects and ideas in a variety of forms to communicate the development of designed solutions. They use a range of preferred techniques to illustrate how products function.

Year 6 Learning Area: Technologies – Design and Technologies (context: Engineering principles and systems)			
Year 6 Achievement Standard At Standard, students identify how people address and overcome competing considerations, including sustainability, when designing products, services and environments for current and future use. In Engineering principles and systems, students connect ways electrical energy can control movement, sound or light in a product or system. In Food and fibre production, students investigate and determine what past, current and future needs are to be considered when designing sustainable food and natural fibre systems for products. In Food specialisations, students identify and consider principles of food preparation and benefits of healthy eating. In Materials and technologies specialisations, students consider suitability of use when defining characteristics, properties and safe handling practices of a range of materials, systems, tools and equipment. With all Design and Technologies contexts, students identify available resources to design a solution for a given task, outlining problem-solving decisions, using sequenced steps. Students develop alternative solutions by designing, modifying and following both diagrammatically and in written text, using a range of appropriate technical terms, technologies and techniques. They select and apply safe procedures when using a variety of components and equipment to make solutions. Students develop criteria collaboratively to evaluate and justify design processes and solutions. They work independently, or collaboratively, considering resources and safety to plan, develop and communicate ideas and information for solutions.			
Weeks	**Syllabus content**	**Content unpacked**	**Suggested teaching and learning experiences**
1–2	**Engineering principles and systems** Electrical energy and forces can control movement, sound or light in a product or system **Technologies and society** How people address competing considerations, including sustainability when designing products, services and environments for current and future use	• Electricity is: ▪ a form of electrical energy that can travel through a circuit ▪ present in nature, as lightning. • Electrical energy can produce: ▪ movement, such as for trains, cars, exhaust fans, hair dryers, food mixers, toothbrushes and remote control toys ▪ sound, such as through speakers, car horns, electric guitars, doorbells/buzzers, security alarms and smoke detectors ▪ light, such as street lights, traffic lights, torches, mobile phones/screens and a variety of globes. • Electrical energy is evident in: ▪ products, such as televisions, computers, washing machines, air conditioners, cordless power drills etc. ▪ systems, such as the local power grid, homes, fuel pumps at petrol station, solar panels, cars, torches (circuit) etc.	• Identify examples of electrical energy that students are familiar with and classify as producing either movement, sound or light. • Make predictions on how electrical energy can produce movement, sound or light in a product. • Make predictions on how electrical energy can produce movement, sound or light in a system. • Research and communicate understanding of how electrical energy can produce movement, sound or light in a product or system. • Discuss various options to ‘turn off’ and ‘turn on’ electrical energy through switches, movement etc.: ▪ use relevant and appropriate terms ▪ develop annotated diagrams to support and demonstrate understanding ▪ demonstrate a simple circuit to show flow of energy, for example, in your home. • Discuss the term ‘competing considerations’ and list several examples, such as sustainable options for programming a washing machine to operate during off peak times. • Research and discuss these competing considerations, including sustainability, for current and future use of electrical energy when designing: ▪ products, such as taps, which are turned on through movement ▪ services, such as sensors, which open doors or turn on lights for the needs of individuals ▪ environments, such as lights turning on for safety in confined spaces or extraction fans turning on based on the quality of the air in the room.
3–5	**Collaborating and managing** Work independently, or collaboratively when required, considering resources and safety, to plan, develop and communicate ideas and information for solutions **Producing and implementing** Select, and apply, safe procedures when using a variety of components and equipment to make solutions	• Work independently and collaboratively to: ▪ develop a range of ideas ▪ plan ways to make solutions ▪ communicate information. • Make solutions for the given task, which includes a simple circuit kit: ▪ identify components of the circuit kit ▪ use appropriate equipment ▪ select and consistently apply safe and appropriate procedures.	• Explore electrical energy and how it produces movement, light or sound in a product in our home and at school. • View and discuss: ▪ examples of circuits in toys and other small handheld devices ▪ online explanations of diodes, particularly light emitting diodes (LEDs) ▪ simple LED circuit kit with lights of various colours. • Work collaboratively to: ▪ develop a range of ideas using light emitting diodes to distinguish common, similar items, such as a pencil case or schoolbag, which may look similar to others in the class ▪ establish a simple criteria for the product, for example, how will my pattern be different/unique? ▪ plan ways to make the solution ▪ communicate ideas to make the solution. • Work independently to: ▪ sketch ideas, which could be used to produce a prototype of the selected product ▪ select one idea and develop a simple plan to decorate a pencil case, for example, to differentiate it from the rest of the class ▪ apply the simple plan, based on requirements of the given circuit kit ▪ use equipment safely and appropriately to make the product, such as a glue gun or scissors. • To a small group, demonstrate how: ▪ the product works ▪ the product meets the established criteria.

Weeks	Syllabus content	Content unpacked	Suggested teaching and learning experiences
			Assessment Complete a Plus, Minus, Interesting activity to reflect the success of the product and possible improvements. Use text and/or diagrams to ensure the assessment is fair and suitable for all students.
6–8	**Engineering principles and systems** Electrical energy and forces can control movement, sound or light in a product or system **Producing and implementing** Select, and apply, safe procedures when using a variety of components and equipment to make solutions	• Select, and apply, safe procedures when using: ▪ components, such as batteries, resistors (microcontrollers and transformers), wires, switches (aluminium foil, sound activated, pressure pad, computerised), light bulbs, LEDs, timers, small motors (to produce movement – fan, sound – buzzer, light – globe) ▪ equipment, such as plastic switches, circuit breakers, switchboards, insulators, tools (pliers, wire strippers, alligator clips, tape, Phillips head screwdriver, copper/standard wire). • Solutions may include: ▪ parallel and/or a series circuit for a product or system ▪ a simple circuit for use in a variety of situations, such as a bell for a scooter or light for a skateboard ▪ voice command/connection via computer/mobile phone. • Electrical energy as: ▪ potential (stored), including batteries ▪ kinetic – transfer of energy through a system, as evident in movement and sound activation.	• Identify and reiterate safe work procedures when using a variety of components and equipment to make a simple circuit. • Select and apply appropriate safe work procedures for making simple circuits with wire, batteries, a light globe and a selection of insulator materials for safety. • Develop annotated diagrams and illustrations to represent circuits developed and tested. • Share annotated diagrams with peers to test the accuracy of the information recorded and to check if design can be replicated. • Explain safe procedures when using a variety of components and equipment to make a simple circuit. • Develop components and equipment to make solutions that may include: ▪ a parallel and/or a series circuit for a product or system ▪ a simple circuit for use in a variety of situations, such as a bell for a scooter, light for a skateboard ▪ various switches to regulate flow of energy in a circuit, such as an on/off switch, voice command, movement, connection via computer/mobile phone, time delay switches and dimmer switches. • Share the developed components with peers. • Draw and annotate the circuitry of the component. • Review the accuracy of the circuitry annotation. • Share and discuss processes and solutions.
9–10	**Technologies and society** How people address competing considerations, including sustainability when designing products, services and environments for current and future use **Investigating and defining** Define a problem, and set of sequenced steps, with users making decisions to create a solution for a given task Identify available resources	• Define a problem: ▪ consider a ‘real world’ situation, such as: ○ globes that illuminate on entering a room/walking along street at night ○ doors that open for a wheelchair or when entering supermarket ○ hand movements that activate the water tap in a community washroom (health) ○ hand print recognition that activates buzzer/doorbell (security) ○ sitting in a chair to activate a fan etc. ▪ identify a need: ○ ask friends, family, users (i.e. those who will use the product, service or environment) ○ listen to a person with a special need ○ think about what people might need in the future. ▪ clarify the situation: ○ who is the user? ○ where will the product or system be used?	• Define a ‘real world’ problem, such as: ▪ lights needing to turn on when entering a room ▪ activation of a buzzer sound or doorbell without having to press one ▪ fan turning on when seated in a particular chair. • Given task could include: ▪ making/adapting a toy, such as a train, soft toy, blocks etc. to create movement, sound, light, such as a bell for a scooter, light for a skateboard or a song/tune for a stuffed toy ▪ addition of electrical circuit for an identified product or system, to add value, for ease of use, improve safety etc. • Create a solution and consider: ▪ the identified users ▪ the skill (ability, age considerations) and knowledge of the identified users ▪ the decision-making skills of the identified users (elderly, children, abilities) ▪ the criteria for success of the product ▪ a range of design ideas to suit the relevant situation and address the needs of the user.
11–12	**Designing** Design, modify, follow and represent both diagrammatically, and in written text, alternative solutions using a range of techniques, appropriate technical terms and technology	• Design: ▪ draw and visualise ideas for product/system diagrammatically – look at existing products/systems ▪ develop ideas and options ▪ consider elements, such as size, shape, colour and principles, such as proportion and contrast ▪ consider the function of the product/system, such as: ○ how will it operate (turn on/off)? ○ does it solve the practical problem (keep you warm)?	• Work collaboratively to: ▪ choose the design idea to suit the relevant situation and address the needs of the user ▪ draw and visualise ideas for the product/system diagrammatically ▪ establish criteria for the product. Will it meet the needs of the user? ▪ develop sequenced steps to create the solution ▪ communicate ideas to make the solution. • Consider available resources: ▪ identify resources provided to create the solution ▪ note additional resources required for simple modifications or changes ▪ identify constraints, such as materials, costs and storage.

Weeks	Syllabus content	Content unpacked	Suggested teaching and learning experiences
	Evaluating Develop collaborative criteria to evaluate and justify design processes and solutions	○ meet the specified need (storage), particular size (smaller scooter for smaller person) ▪ consider the purpose of the product/system ▪ consider the quality of materials used (for strength). • Evaluate collaboratively with team/group/class to: ▪ develop criteria to evaluate design process and solutions ▪ develop criteria to justify design process and solutions.	• Evaluate the solution: ▪ develop logical criteria collaboratively to evaluate the design processes and solutions ▪ share the design solution and the criteria with peers ▪ discuss improvements and/or changes with peers and justify reasons. **Assessment** Assess during the design and making process, and during the evaluation of the solution.
13	**Technologies and society** How people address competing considerations, including sustainability when designing products, services and environments for current and future use **Engineering principles and systems** Electrical energy and forces can control movement, sound or light in a product or system **Investigating and defining** Define a problem, and set of sequenced steps, with users making decisions to create a solution for a given task Identify available resources	• Define a problem based on a 'real world' situation. • Identify the community/individual need and/or environmental need for the product. • Clarify the situation: ▪ who is the user? ▪ where will the product or system be used?	• Work collaboratively to plan, design a solution, and develop a product that: ▪ benefits the community and/or a select community group and/or the environment ▪ includes a circuit where electrical energy can produce movement, sound or light ▪ is ready for class demonstration/use at the end of the semester. • Work collaboratively to plan a solution and consider: ▪ the identified user/s ▪ the skill (ability, age considerations) and knowledge of the identified users ▪ the decision-making skills of the identified users (elderly, children, abilities) ▪ the criteria to determine the success of the product ▪ a range of design ideas to suit the relevant situation and that address the needs of the user. • Select the design prototype to be developed.
14–15	**Designing** Design, modify, follow and represent both diagrammatically, and in written text, alternative solutions using a range of techniques, appropriate technical terms and technology **Collaborating and managing** Work independently, or collaboratively when required, considering resources and safety, to plan, develop and communicate ideas and information for solutions **Producing and implementing** Select, and apply, safe procedures when using a variety of components and equipment to make solutions	• Design: ▪ draw and visualise ideas for product/system diagrammatically – look at existing products/systems ▪ develop ideas and options ▪ consider elements, such as size, shape, colour and principles, such as proportion and contrast ▪ consider the function of the product/system, such as: ○ how will it operate (turn on/off)? ○ does it solve the practical problem (keep you warm)? ○ meet the specified need (storage), particular size (smaller scooter for smaller person) ▪ consider the purpose of the product/system ▪ consider the quality of materials used (for strength). • Alternative solutions: ▪ experiment and try different options – develop and explain options and modifications required to suit a specific user ▪ diagrammatically represent solutions – draw and make notes of modifications, such as colour change to improve safety in low light situations or larger switch for a user with a health issue • provide written text to explain solutions and modifications. • Techniques: ▪ use/apply a range of design techniques/skills appropriate for the development of alternative solutions for the given task.	• Work collaboratively to design, modify and develop a product that: ▪ benefits the community and/or a select community group and/or the environment ▪ includes a circuit where electrical energy can produce movement, sound or light ▪ is ready for class demonstration/use at the end of the semester. • Draw and visualise ideas for product/system diagrammatically – look at existing products/systems. • Work collaboratively to make the design solution. • Apply safe procedures when using a variety of components and equipment to make solutions. • Review the developed criteria to: ▪ evaluate the progress of the design process ▪ assess the suitability of the planned product to meet the requirements of the given task.

Weeks	Syllabus content	Content unpacked	Suggested teaching and learning experiences
		• Technical terms: ▪ use a range of relevant technical terms during the design process. • Technology: ▪ use a range of technologies (mechanical, construction, communications, energy etc.) during the design process to solve problems in practical ways. • Implement advice: ▪ take notes/sketches/drawings ▪ make and justify changes.	
16	**Evaluating** Develop collaborative criteria to evaluate and justify design processes and solutions	• Evaluate collaboratively with team/group/class to: ▪ review developed criteria to evaluate design process and solutions ▪ justify design processes and solutions ▪ discuss and review: ○ improvements and/or changes to the product ○ effectiveness of the decision-making processes ○ sequence of steps undertaken during the process.	**Engineering challenge** • Work collaboratively to evaluate the product that: ▪ benefits the community and/or a select community group and/or an environment ▪ includes a circuit where electrical energy can produce movement, sound or light ▪ is ready for class demonstration/use at the end of the semester. • Demonstrate use of the product to peers. • Provide opportunity for an explanation of the product and its use. • Apply the design criteria and reflect on success, and possible improvements of the design, and other feedback from peers. • Review peer feedback: ▪ justify the product design options ▪ explain the preferred choice based on the consumer and/or client choice/needs/preference. **Assessment** Assess evaluation and justification of design processes and solution.