

AGTA
Awards
Winner 2022



DRONES IN FORESTRY

LESSON SEQUENCE

Years 9-10



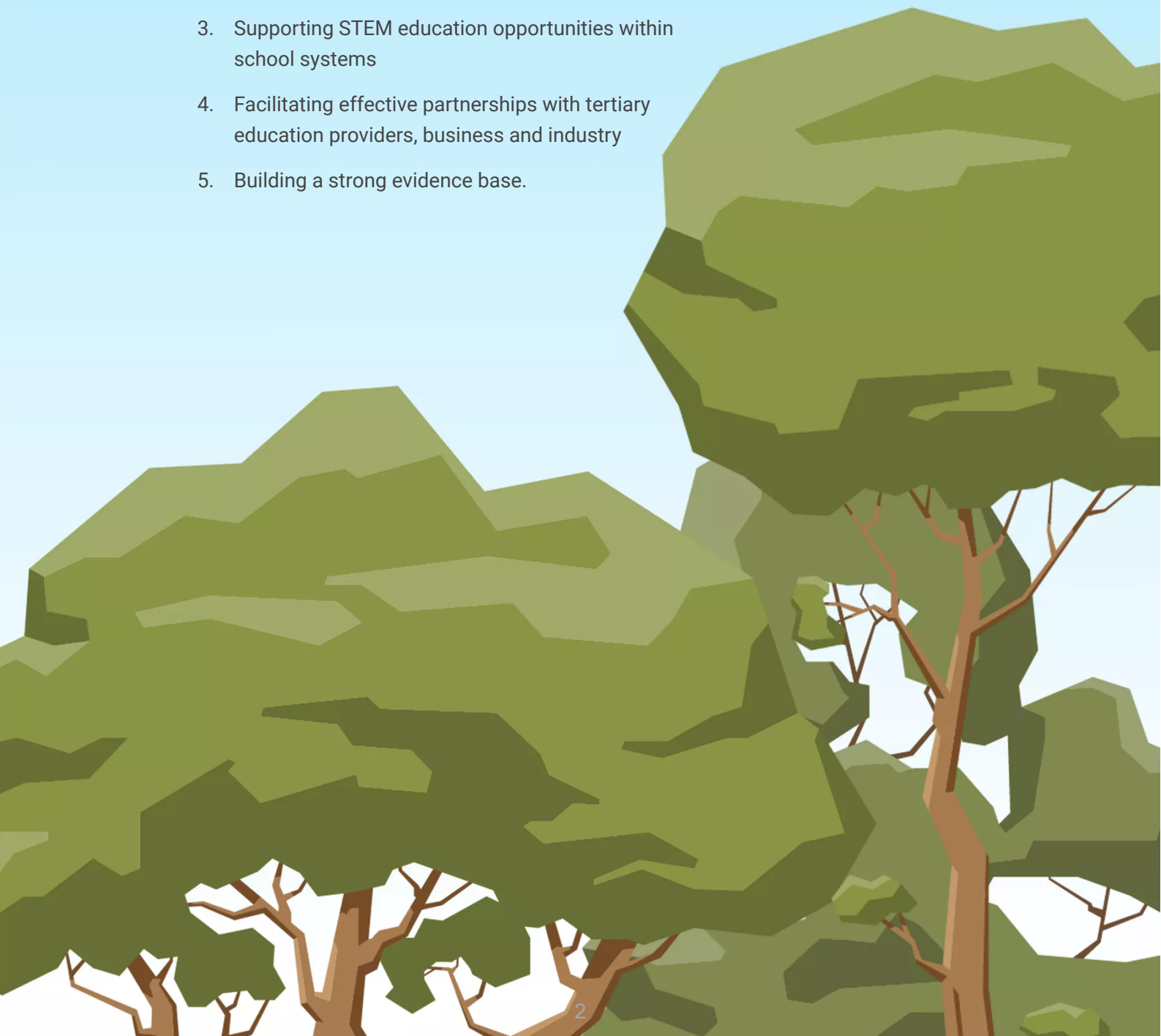
All units of work designed and created by She Maps are linked to the Australian Curriculum across multiple learning areas both inside and outside the STEM-identified subjects.

By using these programs you help to equip your students with the necessary STEM skills and knowledge that will enable them to engage with the careers of the future.

Working in collaboration with schools we set out to achieve the five strategies of action outlined in the [Australian STEM education strategy](#).

This includes:

1. Increasing student STEM ability, engagement, participation, and aspiration
2. Increasing teacher capability and STEM teaching quality
3. Supporting STEM education opportunities within school systems
4. Facilitating effective partnerships with tertiary education providers, business and industry
5. Building a strong evidence base.





Digital Systems In Forestry

Years 9 & 10 Unit Overview

Australia's sustainable productive forests are managed for renewable wood products using a variety of digital systems including drone and satellite technologies. This unit has been designed in modules to cater for equipment access, time constraints and curriculum requirements. Over the entire unit, students will explore and understand how drones and Geographic Information systems (GIS) assist foresters including forest planners to manage the forest environments that provide sustainable and renewable resources for society. They will learn through the use of systems thinking, research digital systems in forestry and understand how they are managed considering environmental, social, economic and technical factors. Students will research and present a case study of how a forestry worker uses drones and digital systems and present this information in the form of a website. They will then complete a simulated forestry drone mission.

LEARNING INTENTION

Explore and understand how drones and GIS are used in real time decision making, business efficiencies, data collection and assist with personal safety in renewable forest management.

SUCCESS CRITERIA

- Understand systems thinking.
- Analyse the environmental, social and economic impact of digital systems in Forestry.
- Develop a Digital Systems in Forestry Report for potential clients or financial backers including a risk assessment plan.
- Research content, source assets and develop a website using HTML and CSS to present a case study of a Forestry worker.
- Design, define and implement a manual flight plan in a simulated forestry training environment.
- Define, design and implement code to demonstrate automated drone flight in a simulated forestry situation.

RESOURCES

Assessment rubric

Module 1:

Digital devices with Internet access.

Classroom display screen.

[StoryMap](#) - Digital Systems in Forestry

Drones in Forestry poster

IPO Student activity sheet

Risk Management Plan template

Group research task sheet

Module 2:

Digital devices with Internet access.

Classroom display screen.

[StoryMap](#) - Digital Systems in Forestry

Case Study Student Response Booklet - print version

[digital version](#)

Module 3:

Class set of drones and digital devices
(1 per 2-3 students)

Epicollect 5 app (search for She Maps
MINIDRONE PREFLIGHT CHECKLIST) or printed
[pre-flight safety checklist](#)

Drawing app/materials

Drone control app with general purpose
programming e.g. [Droneblocks](#)

Optional [image mat](#) for mission



KEY

GEOGRAPHY

DIGITAL TECHNOLOGIES

See [curriculum mapping document](#) for details of Content descriptions and Achievement standards.

UNIT SEQUENCE

STRANDS AND SUB-STRANDS	KEY IDEAS AND CONCEPTS	LESSON SEQUENCE	ACTIVITIES AND ASSESSMENT OPPORTUNITIES
Questioning Knowledge and Understanding <ul style="list-style-type: none"> Digital systems 	<ul style="list-style-type: none"> Interconnections Systems Thinking Impact 	<p>Module 1- (5 lessons)</p> <p>Systems in Forestry – Establishing Prior Knowledge</p> <p>StoryMap chapter: Systems Thinking</p> <p><i>Understanding systems thinking (50 mins)</i></p> <ul style="list-style-type: none"> Explain to students that they are going to look at systems thinking. <ul style="list-style-type: none"> Provide a demonstration of systems thinking ie the game - Mousetrap (0:11) and show this OK GO music video (3:53) demonstration of a Rube Goldberg Machine Watch video - What is system's thinking? (3:56) and discuss some of the systems students are part of. Look at this systems thinking poster and discuss each of the elements. Play this game (as demonstrated in the first part of this video) <ul style="list-style-type: none"> Discuss what happened each time someone was moved and how that affected the rest of the class. Ask students what systems they are aware of that would be impacted by one change. (e.g. ecosystem food chain, car running out of fuel, wheel falling off skateboard etc) Individually students write a statement explaining systems thinking. Contribute answers on Padlet, Miro board or Google Jamboard 	<p>Formative – students responses on collaborative board</p> <p>Resources</p> <p>Teacher reference video - systems thinking activity</p>



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Questioning Researching Knowledge and Understanding <ul style="list-style-type: none"> Digital systems 	<ul style="list-style-type: none"> Place and space Interconnections Systems Thinking Digital systems 	Module 1. Systems in Forestry – Research StoryMap chapter: Systems in Forestry <i>StoryMap research and analysis (50 mins)</i> <ul style="list-style-type: none"> Watch overview video: Seed to Shelter - 360° Video Experience Using the Jigsaw method students work in groups to identify the different systems in Forestry using their assigned Forest VR videos (embedded in StoryMap chapter): <ul style="list-style-type: none"> The Renewable Spotted Gum Forest Story - 360° Video Experience The Renewable Pine Forest Story - 360° Video Experience Log to Lumber - Pine Milling 360° Video Experience Plantation to Paper - 360° Video Experience Tree to Timber - the Spotted Gum Milling Story - 360° Video Experience Forest to Fine Flooring - Complete Spotted Gum Timber Story - 360° Video Experience In their groups students create a flowchart to show their assigned ForestVR process as a system. 	Formative – students responses to Jigsaw task Resources StoryMap - Digital Systems in Forestry ForestVR videos Notes for teacher: How to use the ForestLearning VR synchronisation tool How to complete a Jigsaw task
Questioning Researching Knowledge and Understanding <ul style="list-style-type: none"> Digital systems 	<ul style="list-style-type: none"> Place and space Interconnections Systems Thinking Digital systems Impact 	Module 1. Digital Systems in Forestry StoryMap chapter: Digital Systems in Forestry <i>StoryMap - investigate data flow in digital systems (50 mins)</i> <ul style="list-style-type: none"> Watch Innovation and Technology video (2 mins) IPO activity <ul style="list-style-type: none"> Show students the simple IPO flow diagram examples in the Story Map. In their groups (Jigsaw) students identify a digital system from the previous activity and draw an IPO flow diagram to show a simple process from input to output. (Optional: complete 1st section of IPO Student Activity Sheet) 	Formative – students responses to IPO activity Resources StoryMap - Digital Systems in Forestry IPO Student Activity Sheet



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Questioning Researching Knowledge and Understanding <ul style="list-style-type: none"> Digital systems 	<ul style="list-style-type: none"> Place and space Interconnections Systems Thinking Digital systems Impact 	Module 1. Digital Systems in Forestry (cont') <ul style="list-style-type: none"> Discuss feedback loops and analyse the example for tracking timber products using barcodes in the Story Map. Explain and discuss how IPO flow diagrams with feedback loops can be useful to help monitor economic, environmental and social sustainability. In their groups (<i>Jigsaw</i>) students create an IPO flow diagram with a feedback loop to expand their original diagram of their identified digital system (Optional: complete 2nd section of IPO Student Activity Sheet) 	Formative – students responses to IPO activity Resources <i>StoryMap</i> - Digital Systems in Forestry IPO Student Activity Sheet
Questioning Researching Knowledge and Understanding <ul style="list-style-type: none"> Digital systems 	<ul style="list-style-type: none"> Place and space Interconnections Systems Thinking Digital systems Impact Interactions 	Module 1. Digital Systems in Forestry <i>StoryMap</i> chapter: Group Research Task - Digital Systems in Forestry <i>StoryMap</i> - investigate digital systems in forestry (2 x 50 mins) As a class, view the Drones in Forestry poster and discuss. In their groups (<i>Jigsaw</i>) assign students a digital system to research from the <i>StoryMap</i> chapter: Group Research Task - Digital Systems in Forestry <ul style="list-style-type: none"> Group 1: GIS and drones <i>Forester time with Sarah Maddison</i> (14:24) Group 2: Drones and forest fires Drones. <i>A New View of Fighting Forest Fires</i> (2:11) + Online article: <i>Drones starting fires on purpose in Victoria</i> + <i>Channel 7 story and press conference</i> (watch to 10:30) + online article: <i>Channel 9 story</i> (1:38) <i>Firefighter drones to battle bushfires on the horizon?</i> (1:19) (Total video content: 15:28) Group 3: Drones and forest management <i>NSW Forest Monitoring and Improvement Program: Ground Based LiDAR Pilot</i> (5:33) + Woodchat - <i>The increasing use of drones in forest management</i> (28:03) Group 4: Eagle Eye Project - Woodchat - <i>A digital forest? The future is coming!</i> (20:17) + online article: <i>Remote sensors to protect endangered bird</i> Group 5: Integrated weighbridge systems for timber haulage <i>Green triangle synchronised systems</i> (7:23) + review LOGR Air systems on <i>LOGR website</i> Group 6: Tracking timber Woodchat - <i>Re-imagining the log and woodchip export supply chain for improved efficiencies</i> (listen to 6:35) + DNA fingerprint Map online articles: <i>DNA tracking of timber to increase forest sustainability and integrity</i> and <i>DNA database will trace illegal logging</i> and <i>Blockchain comes to forestry</i> Provide students with Group research task sheet and <i>Risk Management Plan template</i> Students complete report and share with class as a group presentation.	Formative – students responses to group research task Resources <i>StoryMap</i> - Digital Systems in Forestry Drones in Forestry poster Group research task sheet <i>Risk Management Plan template</i>



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Researching Knowledge and Understanding <ul style="list-style-type: none"> Digital systems 	<ul style="list-style-type: none"> Place and space Interconnections Systems Thinking Digital systems Impact Interactions 	Module 2 - (5 lessons) Case Study of Mike Sutton StoryMap chapter: Case Study - Mike Sutton <i>StoryMap - Introduction to Mike Sutton (50 mins)</i> <ul style="list-style-type: none"> Explain to students that they will be creating an individual website to showcase how Mike Sutton and his team use digital systems to manage forests in NSW. As a class, read the introductory text in the Story Map and watch the video of Mike Sutton presenting about the use of RPAS (drones) for forest and fire management in NSW State forests. (7:40) <ul style="list-style-type: none"> Have students answer the video 1 questions on the Case Study Student Response Booklet print version / digital version as they are watching the video. Divide students into groups to compare their notes and fill in gaps in knowledge. Have students highlight words or terminology they are unfamiliar with. As a class, discuss the answers and discuss any terminology that students are unfamiliar with. These can either be answered by other students, the teacher or be recorded as questions for further research. 	Formative – students responses in Case Study Student Response Booklet Resources StoryMap - Digital Systems in Forestry Case Study Student Response Booklet print version / digital version
Researching Knowledge and Understanding <ul style="list-style-type: none"> Digital systems 	<ul style="list-style-type: none"> Place and space Interconnections Systems Thinking Digital systems Impact Interactions 	Module 2. Case Study of Mike Sutton - research StoryMap chapter: Case Study - Mike Sutton <i>StoryMap - Individual/partner research of video 2 - Digital Forester Podcast Interview with Mike Sutton (50 mins)</i> <ul style="list-style-type: none"> Have students follow instructions on the Case Study Student Response Booklet print version / digital version to answer the video 2 questions where Mike Sutton is being interviewed by Kevin Lim for the Digital Forester podcast. 	Formative – students responses in Case Study Student Response Booklet Resources StoryMap - Digital Systems in Forestry Case Study Student Response Booklet print version / digital version
Researching Knowledge and Understanding <ul style="list-style-type: none"> Digital systems Representation of data Processes and Production Skills <ul style="list-style-type: none"> Evaluating Collaborating and Managing 	<ul style="list-style-type: none"> Place and space Interconnections Systems Thinking Computational Thinking Design Thinking Digital systems Impact Interactions Data representation Specification 	Module 2. Case Study of Mike Sutton - research StoryMap chapter: Case Study - Mike Sutton <i>StoryMap - Individual/partner compilation of research on Mike Sutton and the use of drones and digital systems in Forestry (50 mins)</i> <ul style="list-style-type: none"> Students work together or individually to pull together assets and information to form a case study of Mike Sutton in preparation for building their website. 	Formative – student research notes Resources StoryMap - Digital Systems in Forestry Case Study Student Response Booklet print version / digital version



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Researching Knowledge and Understanding <ul style="list-style-type: none"> Digital systems Representation of data Processes and Production Skills <ul style="list-style-type: none"> Evaluating Collaborating and Managing 	<ul style="list-style-type: none"> Place and space Interconnections Systems Thinking Computational Thinking Design Thinking Digital systems Impact Interactions Data representation Specification 	Module 2. Case Study of Mike Sutton - website construction StoryMap chapter: Case Study - Mike Sutton <i>StoryMap - Individual website construction on Mike Sutton and the digital systems he uses in forestry (2 x 50 mins)</i> <ul style="list-style-type: none"> Students work individually to build their website to showcase how Mike Sutton and his team use digital systems to sustainably manage forests in NSW. Students should include photographs, videos, diagrams and text and use HTML and CSS to create their websites. 	Summative – student website Resources StoryMap - Digital Systems in Forestry Case Study Student Response Booklet print version / digital version
Processes and Production Skills <ul style="list-style-type: none"> Collecting, managing and analysing data Collaborating and Managing 	<ul style="list-style-type: none"> Systems Thinking Interactions 	Module 3. Design and Implement a Flight Path for a Drone Mission Simulation – Setting up the Drone Mission <i>Complete drone safety checklist in student groups of 2 or 3 (5 mins)</i> <ul style="list-style-type: none"> Provide students with a contextual mission to solve using either an image mat or create a simulated course with blocks and other objects for students to solve. For example, plan a (simulated) mission to identify which areas of the forest are smouldering after a recent fire. Using either Epicollect 5 (search for She Maps MINIDRONE PREFLIGHT CHECKLIST) or a (laminated) printout of the pre-flight safety checklist, lead students through their pre-flight safety checklist. 	Summative – completed pre-flight safety checklist Resources pre-flight safety checklist Epicollect 5 (search for She Maps MINIDRONE PREFLIGHT CHECKLIST)
Evaluating and reflecting Processes and Production Skills <ul style="list-style-type: none"> Investigating and defining Generating and designing 	<ul style="list-style-type: none"> Place and space Specification Algorithms 	Module 3. Design and Implement a Flight Path for a Drone Mission Simulation – Plan the Drone Mission <i>Draw a drone flight path and step out the path in groups of 2 or 3 (15 mins)</i> <ul style="list-style-type: none"> Students design their flight path using drawing tools, Notes (Apple) or Kids Doodle (Android) and take it in turns to step out their mission to determine distance and types of turns required by their drone to complete the mission. Remind students to add symbols in their mission path to indicate where they take off and land, yaw, and intend to photograph the smouldering areas. 	Formative – drawn drone flight path Resources image mat or simulated course



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Evaluating and reflecting Processes and Production Skills <ul style="list-style-type: none"> Generating and designing Producing and implementing Evaluating Collaborating and Managing 	<ul style="list-style-type: none"> Place and space Systems Thinking Computational Thinking Design Thinking Algorithms Implementation Interactions 	Module 3. Design and Implement a Flight Path for a Drone Mission Simulation – Code the Drone Mission <i>Code and test (iteratively) drone flight path in groups of 2 or 3 (15 mins)</i> <ul style="list-style-type: none"> Using your app of choice, e.g. Droneblocks, students program sections of their path and test the code iteratively until they have coded the whole mission. Remind students to include lines in their mission code to photograph the smouldering areas. 	Formative – coded drone flight path Resources Image mat or simulated course
Evaluating and reflecting Processes and Production Skills <ul style="list-style-type: none"> Producing and implementing Evaluating Collaborating and Managing 	<ul style="list-style-type: none"> Place and space Systems Thinking Computational Thinking Design Thinking Algorithms Implementation Interactions Impact 	Module 3. Design and Implement a Flight Path for a Drone Mission Simulation – Complete the Drone Mission <i>Demonstrate drone mission in groups of 2 or 3 (15 mins)</i> <ul style="list-style-type: none"> Student groups take it in turns to demonstrate their successfully coded missions and explain how their digital solution would take account of environmental, economic and social factors predicting outcomes of their use of drone in addressing the missions' goal, for example, rehabilitation of the forest after a fire. Award points for the most efficient control structures in the code. 	Summative – demonstration of successful drone mission Resources Image mat or simulated course

EXTENSION

If you would like to deepen the learning from of this lesson and/or provide extension for students, we recommend that:

- Students use modular functions to automate and streamline their code to make it more efficient considering sustainability factors.
- Students participate in a supervised field trip to visit a State Forest (with permission) and undertake a drone mission with a sub 2kg drone.

THANK YOU!



This unit of work has been brought to you by She Maps and was developed in partnership with ForestLearning. You can find out more about ForestLearning at forestlearning.edu.au

We hope that you love our resources, and that you are excited for what we will release next! To see more She Maps resources check out our [Teacher resources page](#).



AGTA Awards



Winner 2022

Category:
Digital/Online Resource

Resource:
Years 5-6 Drones in Forestry
Years 9-10 Drones in Forestry

Publisher:
ForestLearning and She Maps

This certificate has been presented in recognition of the quality of the product in terms of its:

- ❖ currency
- ❖ authenticity
- ❖ application of contemporary understandings about how students learn
- ❖ the use of cutting-edge production, and
- ❖ contemporary and innovative style in supporting geographical education in Australian schools.

The ForestLearning and She Maps Drones in Forestry units dynamically engage with emerging technology for a contemporary learning experience for all students. The significant support and resourcing attached to the unit empowers teachers to implement contemporary geographic tools in their curriculum, underpinned by strong vocational links.

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