CREATING A SMART HOME

Levels 7-8

This unit of work was created in collaboration with the Digital Technologies Teacher at Ivanhoe Girls' Grammar, Victoria

Unit Overview

This unit of work investigate STEM concepts through the use of Cubit Robotics. Students will have an option to use STEM skills such as design, evaluation, design, critique, design evaluate) to explore how robotics and technology can support real world STEM issues. Students will design and create a smart. Within their design students will choose different robotics to complete different functions.

Other Curriculum Targeted Areas

Other curriculum areas can be targeted and assessed within this unit.
Other areas of interest may include:

- Design and Technology
- Science
- Critical and Creative thinking

Further investigation into these areas is required to ensure they align with the following activities. Activities may need to be modified to ensure content descriptions and achievement standards are met.

Australian Curriculum Alignment

The following sessions have been created using the Australian Curriculum: Digital Technologies Curriculum. Tasks may need to be modified to ensure state Digital Technologies Curriculum content descriptions and achievement standards are met. ACS has support and documents to help align this unit to other Digital Technology Curricular.

Session

'Session' has been used to define the order of tasks to complete the unit. It does not define a set time required to complete the task. Time allocated to complete a session is the teacher's discretion. This allows for flexibility for the teacher to drive the duration of the task and make modifications if necessary. Sessions can be merged into one set period or sessions may run over multiple periods.

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Key Preparation

Robotics

The aim of this unit of work is to use a selection of robotics to solve problems in different rooms of a house. Devices will depend on what is available at the school. Ideally this unit of work is to be taught towards the end of the year when students have had substantial practice with robotics.

ACS Resources

Resources have been created to help teachers and students unpack and understand topics found within the Digital Technologies Curriculum. These give brief explanations of the topic and the expectations to teach the topic at the curriculum year level. It is intended the information is presented in a way that will set the foundation for further research. ACS has resources to support the teaching of the Digital Technologies Curriculum from Foundation to Year 10. Access resources via: https://www.acs.org.au/ict-educators.html

Key Understandings

Students will:

- Analyse how current technologies can be utilised to help solve real world STEM problems.
- Choose a project to solve a STEM problem.
- Design their solutions and prepare materials and organise the Cubit. components that will be used for the project.
- Follow a series of steps and code to Cubit.
- Evaluate and analyse their digital solution based on a set criterion.

Key Questions

- How can technology used to help solve STEM related issues in our society?
- What are the benefits when we solve these issues?
- How can robotics and technology be used to help solve some of these issues?
- What problem are you wanting to solve?
- What is the purpose of your design?
- What resources do you need?
- What instructions do you need to follow to code the Cubit?
- What code will you need to include to ensure your design works correctly?
- What will a plan of your code look like?
- How will you evaluate your design?

Key Vocabulary

Collaboration, protocols (ethical, social and technical protocols), digital solutions, functional requirements, constraints (social, technical, economic environmental), user experience, general purpose programming, algorithms, branching, loops, variables, iteration, user input, design thinking, data, data collection, evaluation, digital solutions

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Session Number	Session Focus	Learning Intention and Success Criteria	Introduction/Teacher Instruction	Whole Class Activity
1.	Collaboration	**Learning Intention** Students will generate and adhere to protocols when working in online spaces. **Success Criteria** I can create a guideline that I will abide by when using digital technology to work with technology and in small groups.	Introduce students to a digital collaborative space. Discuss the right and wrong way to use this space.	Each group creates a guideline to include social, ethical and technical protocols to abide by during their time working on their project and working with others in the class.
Session Resources	**Student Resources** • ACS Student Resource: Online Protocols		**Teacher Resources** • ACS Teacher Resource: Online Collaboration	
2.	Real world relevance	**Learning Intention** Students will explain how technologies can be used in and around the home to help different demographics. **Success Criteria** I can explain how technologies can be used around the home to help solve problems for different users.	Discuss with students the types of technologies they have around or use at home.	Using the resources provided to students, they explain and evaluate how different
Session Resources	**Student Resources** • Project summary • Project initial evaluation questions		**Teacher Resources** • Project summary • Project initial evaluation questions	

Session Number	Session Focus	Learning Intention and Success Criteria	Introduction/Teacher Instruction	Whole Class Activity
3.	Design	**Learning Intention** Students will design a floor plan of a house to include technologies in each room to create a smart house. I can create a floor plan of a house that includes the use of technologies in each room.	Introduce students to the 3 different personas for the design of the smart house. Discuss similarities and differences and how the technology can support these personas.	Students commence designing the floor plan of their home. Their design needs to include: • A floor plan to include all the rooms that are required as part of the persona. • Identifying the types of technologies that can be found in each and explain what problem it will help solve for the user. • Identify the type of technology that would be best suited to help solve the problem. *It is expected this session will run over multiple timetabled lessons
Session Resources	**Student Resources** • Design brief • User Personas		**Teacher Resources** • Design brief • User Personas (not provided)	
4.	Organising the project	**Learning Intention** Students will identity the components needed to complete their design project to help commence construction. **Success Criteria** I can complete a graphic organise that identifies the tasks my team has to complete.	Introduce students to the graphic organiser and discuss each of the steps/sections. As a class fill out the graphic organise. This will help students to stay focused on the jobs they need to complete for the house.	Students complete their staircase graphic organiser to map out the tasks, materials and resources needed to complete the project.
Session Resources	**Student Resources** • Staircase graphic organiser (blank template)		**Teacher Resources** • Staircase graphic organiser (completed template)	

Session Number	Session Topic Focus	Learning Intention and Success Criteria	Introduction/Teacher Instruction	Whole Class Activity
5.	Flowcharts	**Learning Intention** Students will create a flowchart to explain how the robotics will be used to complete a desired task. **Success Criteria** I can create a flowchart of two of my rooms to show the explicit steps need to program the robotics.	Introduce students to a flowchart. As a group, go through the flowchart and look for possible errors and	Students complete a flowchart for at least two of the devices used in 2 different rooms.
Session Resources	**Student Resources** • Program to help create a flowchart (not provided)		**Teacher Resources** • Flowchart example (not provided)	
6.	Programming	**Learning Intention** Students will use the flowchart to program the robotics. **Success Criteria** I can follow my flowcharts to code the robotics to create a smart house.	Students share their flowcharts and explain to each other how the robotics will complete a task. They use this time to identify any potential errors or 'bugs' in their	Students commence programming their first task. Once completed and are successful they will move onto the next room. *It is expected this session will run over multiple timetabled lessons
Session Resources	**Student Resources** •		**Teacher Resources** •	

Session Number	Session Topic Focus	Learning Intention and Success Criteria	Introduction/Teacher Instruction	Whole Class Activity
7.	User Experience	**Learning Intention** Students will create a wireframe to showcase the technology within the design of the smart house. **Success Criteria** I can create a mock up of what the technology could look like in the home.	Discuss with students how user experience and design is important. Evaluate different technologies from the user experience design.	Students will design a wireframes on one of technologies used in a room. They will design a screen/monitor that would look appealing for the user. They will take into consideration, colours, fonts and styles.
Session Resource	**Student Resources** •		**Teacher Resources** • Different technologies	
8.	Evaluation	**Learning Intention** Students will evaluate their project and design based on a set criterion. **Success Criteria** I can evaluate my design by following a set of questions and prompts.	Students share their projects and solutions with their peers. They explain their design and provide insights and explain choices they have made throughout the project (choices of technologies, design, programming).	Students complete a range of questions and prompts to evaluate their digital systems.
Session Resource	**Student Resources** • Key Questions: Final Evaluation		**Teacher Resources** •	

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Project Summary

Ever used Siri or Google or Alexa to help you with a question or ask them to play your favourite song? That type of technology is become popular in our homes. We can use voice activation. We can use motion sensors. We can use technology to monitor the temperature and if it gets too hot the air con automatically turns on.

You have been asked to create a 'smart home' You will draw up plans of an average size home (not a mansion, one story house with a couple of bedrooms, kitchen, lounge room and bathroom). As you are planning and designing your house, start to think about the different rooms and how you can use technology.

You will use the Cubit kits to code and create your smart house. The types of components you will use include:

- Sensors and LED to create automatic lights.
- Servo motors to open/close doors
- Buzzer for sound 9 (alarm)
- Temperature to turn on servo motors (used like fans) if it gets too hot.

These are just some if the ideas, look through your kit, learn about the parts and consider how you can used them to create a smart house.

Project Overview

Here are the important things you need to do:

- Start your investigation by learning about smart home technology. What is already happening in homes? Identify different technologies and explain how this technology works. Be critical, look at the positives and negatives of this technology. Find technology that is used in at least every room in a home.
- Create the drawing plans for your home. They do need to be to scale but not a giant plan. Check out homes in your local area that are for sale on the internet. Find floor plans to copy. Use the 2d floorplan to build a cardboard 3D model over the top (walls but no roof).
- Using your initial investigation, develop technologies for each room. You can only use the same technology twice! Experiment with different ideas.
- Decide on the type of technology you will add to each room and identify which Cubit Kit components you will be using.
- Make a list of the skills you need to develop to code the different parts (e.g. code LED Strip and senor to turn lights on and off automatically).
- Start coding! Use the Cubit Workshop and connect your Cubit. Think critically about your code too. Don't forget to use the bug icon if your code doesn't work the way you want it to.
- Add your components to the house! Test out your smart home. Make improvements when needed. Think outside the box. What could be a really cool invention?

Initial evaluation questions		
Topic	**Questions**	**Evaluation**
Setting the Scene	• What technologies are used in homes? How can this technology help people (look into technologies helping people with disabilities too)? Is this technology helping any environmental issues?	
Basics	• What is the name of the device/ digital solution and who or what company was responsible for created it?	
Explanation	• In 3 sentences or less explain the idea behind the digital solution. • What is the primary function of the device?	
Problem solving	• What problem is the device trying to help solve? • What need is it meeting? • How is this innovative?	
Functional requirements	• What are the functional requirements (what are the must haves of the tech to make it work) of a digital device like to operate?	
Technical constraints	• What issues do you think users could have when using technology like this? Battery life, wet weather, lack of mobile network range etc	

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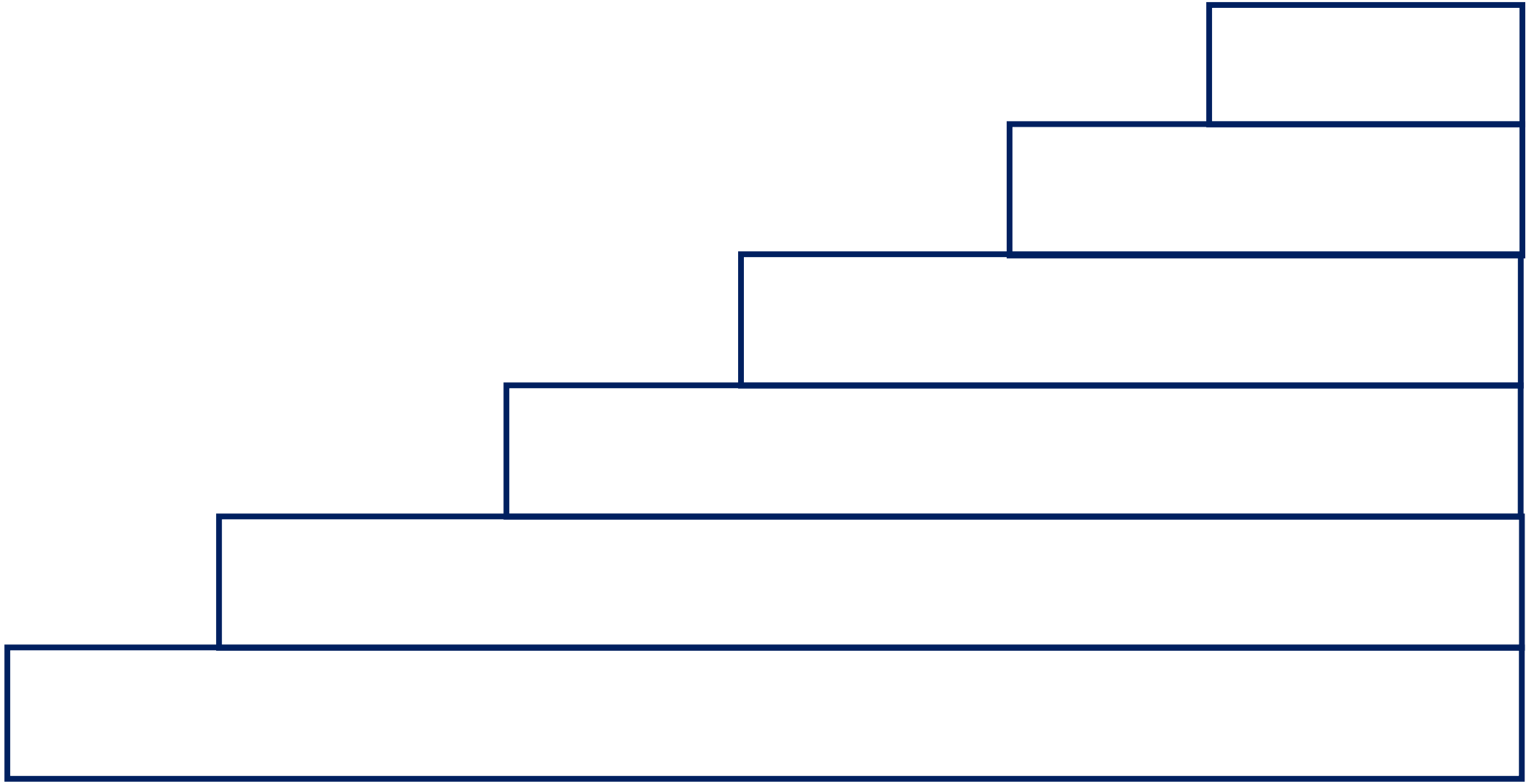

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Example of a stair organiser. A staircase graphic organizer identify the steps involved that are needed to complete a project. Students will continue to refer to this planner as the project develops. Teachers can sign off at each stage and students cannot move or progress until teacher has sign off each step.

Continuing coding other rooms

Redesign the user experience and design of one of these technologies

Commence coding Rooms 1 and 2

Discuss and design the types of technology that will be used in each room of your house. Identify what problem you are solving, technologies you need and what you are aiming the technologies to do and what technologies you need and what you want them to do. Create an order of which rooms you will code.

Design your house and create a floorplan of your house.

Look at how countries around the world are creating houses that help people around the world. Watch videos on the types of technologies they use.

Final Evaluation	
Questions/Prompts	**Evaluation**
Self-Evaluation • Explain your digital solution. • What is the purpose of your digital solution? • How does your design and solution help your identified users? • How could it meet the needs of others? • What makes this digital solution innovative? • What are the potential risks that could occur from your digital solution? • If you were to develop this solution again, what would you do differently? • Where there any design features that you liked from the other designs? • What challenged you? How did you overcome those challenges?	

Assessment – Australian Digital Technologies Curriculum			
Content Description	**Session**	**Assessment Piece**	**Assessment Statement**
Investigate how data is transmitted and secured in wired, wireless and mobile networks, and how the specifications affect performance (ACTDIK023)	N/A		
Investigate how digital systems represent text, image and audio data in binary (ACTDIK024)	N/A		
Acquire data from a range of sources and evaluate authenticity, accuracy and timeliness (ACTDIP025)	N/A		
Analyse and visualise data using a range of software to create information, and use structured data to model objects or events (ACTDIP026)	N/A		
Define and decompose real-world problems taking into account functional requirements and economic, environmental, social, technical and usability constraints (ACTDIP027)	2	Initial evaluation	Students evaluated current technologies and investigated how it was used to help a real world problem. When designing their digital solution they too into account the functional requirements and identified any potential constraints.
Design the user experience of a digital system, generating, evaluating and communicating alternative designs (ACTDIP028)	3	Design of house and robotics	Students designed a digital solution, taking into consider the user experience by generating and reflecting on their design.
Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors (ACTDIP029)	5	Flowcharts	Students created flowcharts to represent the code they will use to program the robotics to complete the task in each room of their mart house.
Implement and modify programs with user interfaces involving branching, iteration and functions in a general-purpose programming language (ACTDIP030)	6	Programming the Cubit	Students used a general purpose programming language to code the robotics to perform a range of tasks in their house design.
Evaluate how student solutions and existing information systems meet needs, are innovative, and take account of future risks and sustainability (ACTDIP031)	8	Final evaluations	Students evaluated their digital solution and reflected on how their solution met a need and was innovative and identified any potential risks.
Plan and manage projects that create and communicate ideas and information collaboratively online, taking safety and social contexts into account (ACTDIP032)	1	Collaboration throughout the unit	Students developed and followed a set of protocols when working collaboratively in online spaces.