



Technologies Project

Years 5&6

Conserving Energy

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About this Project

This project explores the conservation of energy in family households.

It brings together the two Australian Curriculum Technologies streams (Design & Technologies, and Digital Technologies) to

- switch off the lights in a model house using a Kookaberry and a preloaded app (D&T)
- recreate the app from scratch using the KookaBlockly visual code editor (DT)

The Boston Museum's "Engineering is Elementary (EiM)" [Engineering Design Process](#) is used to guide this Project.

Practical Outcomes

Students will learn about energy conservation in the home and how to create a customized app that is in common use in the real world.

Learning Outcomes (D&T)

Students will use peripherals; position and format text on a screen; create and manipulate strings and variables; receive, transform, and transmit data; scale readings; and implement logic conditions and thresholds.

Learning Outcomes (D&T)

Students will learn collaboration, design, creative, and project management skills, and how to follow design briefs

Prior Knowledge

Familiarity with visual programming editors such as Scratch, and with the following Tutorials

- [STEM Journey Class Kit](#)
- [Getting Started](#)
- [Exploring the Kookaberry](#)
- [Introduction to digital systems](#)
- [Using the KookaManager](#)

Research Considerations

- Review the Unit of Work "[Be Energy Efficient](#)" and determine where this Kookaberry project can add experiential value. *[Note: saving electricity by turning off lights is not specifically covered in this Unit – it should be...]*
- Discuss the article "[Facts About Turning Off Lights to Save Energy](#)" and ask the students to bring a copy of their home's energy bill to calculate cost.



The Design Brief

Design & Technologies

You want to do your bit to reduce global warming by switching off the lights automatically when day breaks.

The task of your students is to

- Research energy saving techniques in a modern house
- Make a model house
- Use the Kookaberry, selected peripherals, and a suitable app to simulate lights that are lit when the outside light is dim, and are turned off when the outside light is bright
- Reflect on what they have created and improve upon it
- Consider safety in the use of sharp instruments when making models



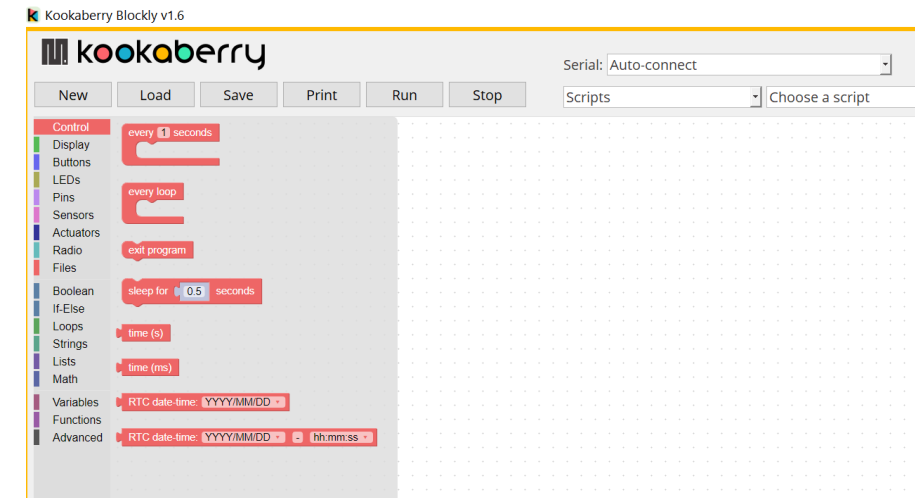
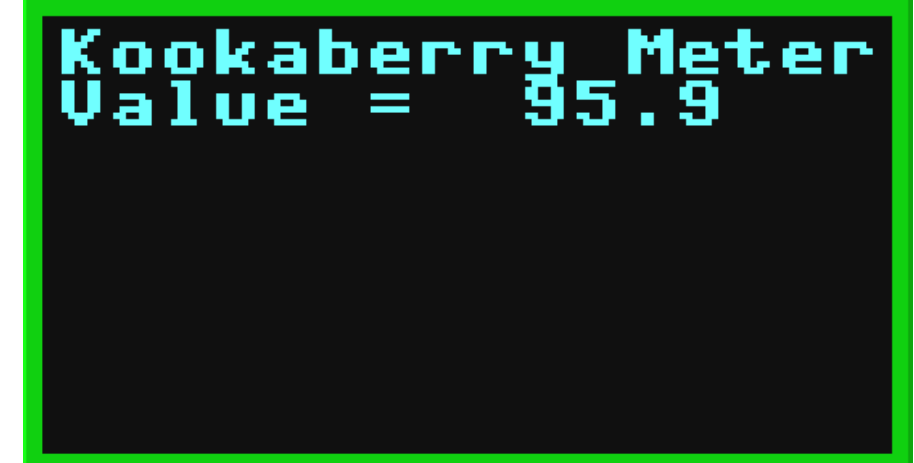
The Design Brief

Digital Technology

You are paying a license fee to use the pre-coded app.

The task of your students is to

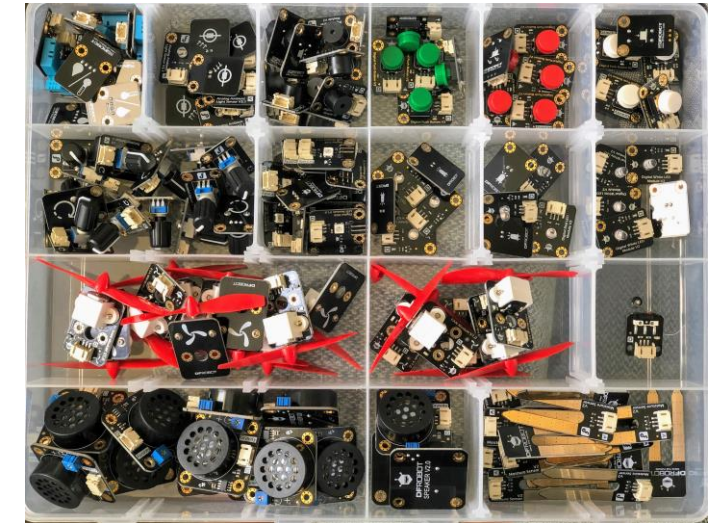
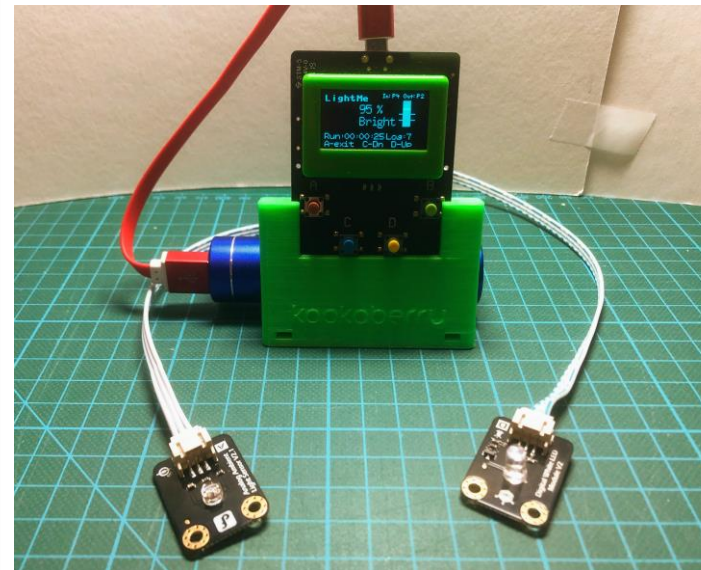
- Create their own app using the KookaBlockly visual code editor
- Create text “Kookaberry Meter” and “Value” on two separate lines
- Display Value = [% of light] to one decimal place
- Light the LED if the light level falls below a set %.





Student Resources

- Your resources include
 - A Kookaberry and its power supply
 - A kit of assorted peripherals.
 - Connecting leads
 - A3 Quill Thick Board 600gsm
 - Scissors/pencil/ruler/glue
 - BluTack
 - The Kookaberry website where you can find full details of the LightMe App and all the possible peripherals
 - The KookaBlockly visual code editor
 - A computer (for the coding exercise only)





The Engineering Design Process

The Engineering Design Process or Design Thinking Cycle is fundamental to the creation of effective solutions to Design Briefs.

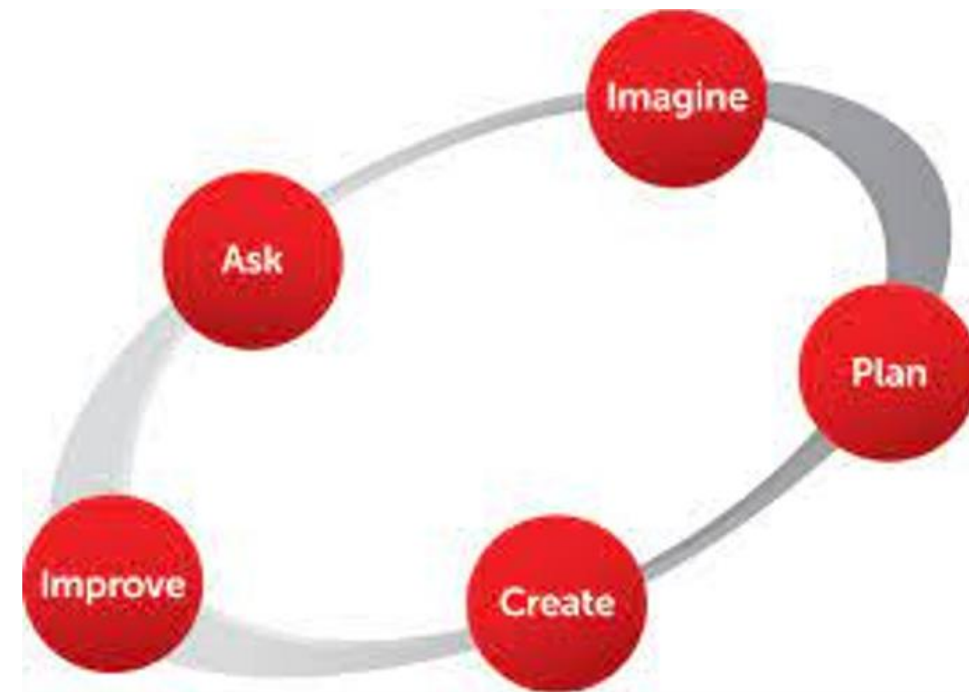
Whatever terminology is used, the basic principle is that a teacher encourages students towards solutions of their own invention rather than all of them following a single pre-prepared solution.

Open questions are used to guide students' research under the guidance of the teacher.

Teams having difficulty developing suitable solutions at the Ask and Imagine stages can be provided with all or part of the worked solutions included at the end of this presentation.

They will have every opportunity show initiative and innovation by reflecting on their work at the Improve stage

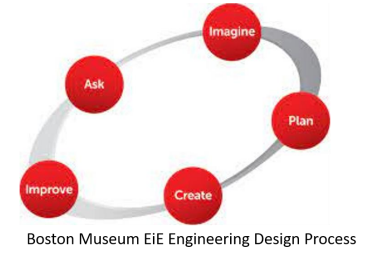
Space has been left in the following slides for teachers to add more scaffolding



Boston Museum EiE Engineering Design Process



Ask



Be clear how much time your students have to complete their solutions to the two Design Briefs.

Considering the available Resources and Design Briefs, encourage them to ask clarifying questions such as

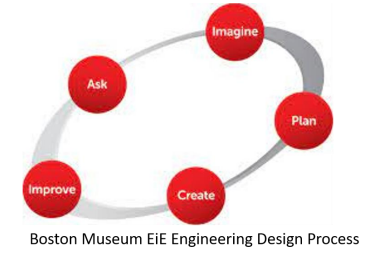
- Does the house have to be made of cardboard?
- How much time should we spend on each Stage?
- Where can we find details of the peripherals and apps we can use?
- Can we work on both Design Briefs at once?
- Do we have to turn the lights in the classroom off?

Have each team write down all the resources and processes they believe they will need, and the reasons for choosing them

There are many ways to construct the project and your students should be encouraged to “think outside the box”



Imagine



Have the teams imagine all the different ways in which they could design a solution to the D&T Design Brief

- Do we make a house or use a readily available one?
- Where would we mount the peripherals?
- How shall we decorate the house?

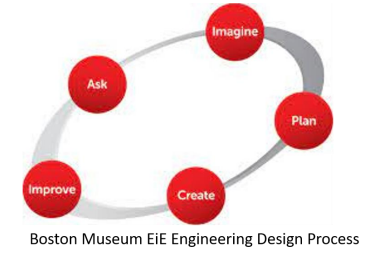
Encourage each student in a team to use their own imagination to draw up solution(s) and share them with their team.

Showcase the short lists from each team

Pick one or two and ask the team to describe to the class how they arrived at their short list.



Plan



Each team reduces their shortlist to one solution that all can agree on and writes down the reasons for adoption.

They also write down their reasons for rejecting alternatives

The project plan should be divided up into packages of work and a time allocated for each package.

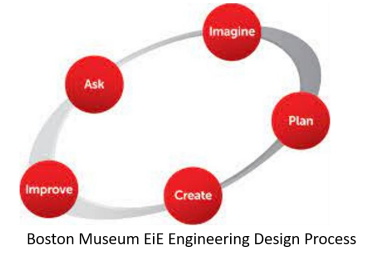
Each team allocates and writes down roles for each member in the design and construction of the preferred solution.

One member should be responsible for creating a team folder on a PC to save and backup files.

Provide all or part of the worked solution to those teams having difficulty working out their own solution. There will be opportunity for innovation in the Improve stage of the process.



Create



Each team creates their preferred solution to the Design Brief(s) in accordance with their agreed Plan.

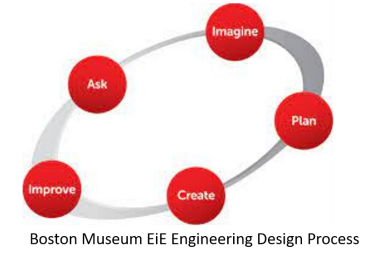
Note: The ambient light level in the classroom – even if the lights are dimmed – may be too bright to make the light stay on. I.e., the level is not falling below the threshold level set by Buttons C&D.

There are two ways of dealing with this issue and the teams should consider what to do about it.

The two solutions can be found in the Worked Solutions section of this presentation.



Improve



This is, in many ways, the most important stage of the process, and the most valuable lesson to be learnt from it.

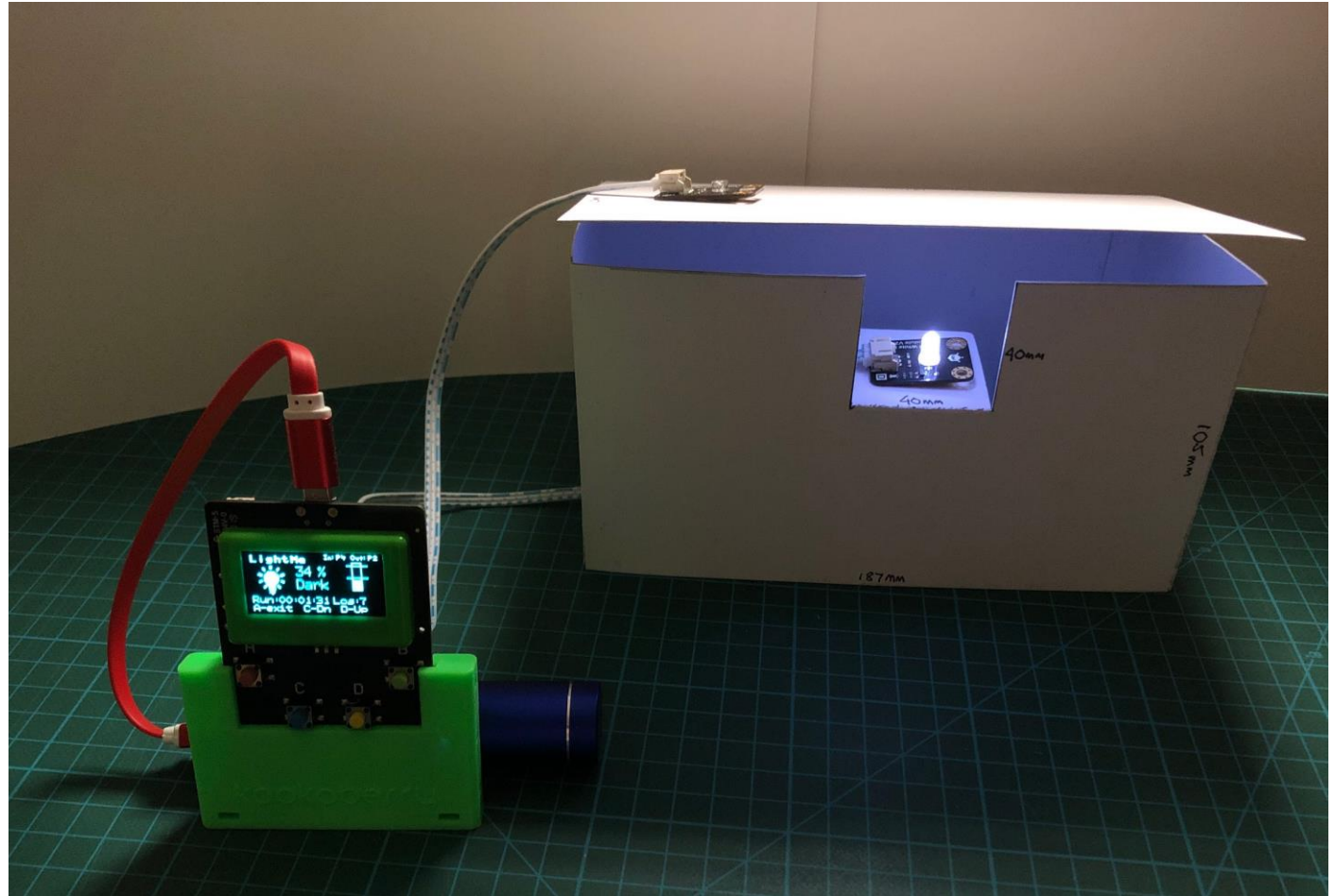
There are so many variables involved in creating a solution to a Design Brief, and so many potential solutions, that the first attempt is usually just a prototype from which lessons can be learnt for later, improved solutions.

Your students should carefully analyse their completed project and write down all the ways in which they believe it could be improved.

Have the teams do it all again in a separate lesson after they have researched ways to improve their first attempt.



Worked Solution for the Project's Design & Technologies Brief





The Kookaberry LightMe App

How it works

The pre-coded Kookaberry LightMe app measures the level of ambient light and sends the data back to the Kookaberry on Pin 4 as an analogue signal..

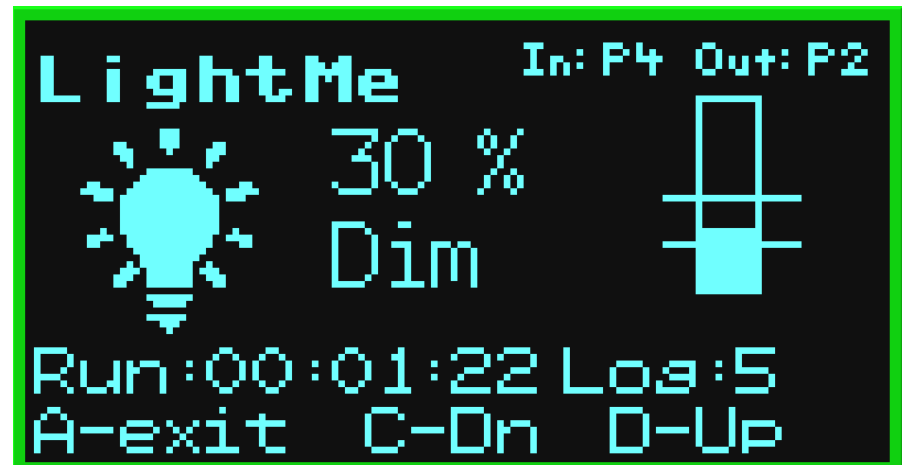
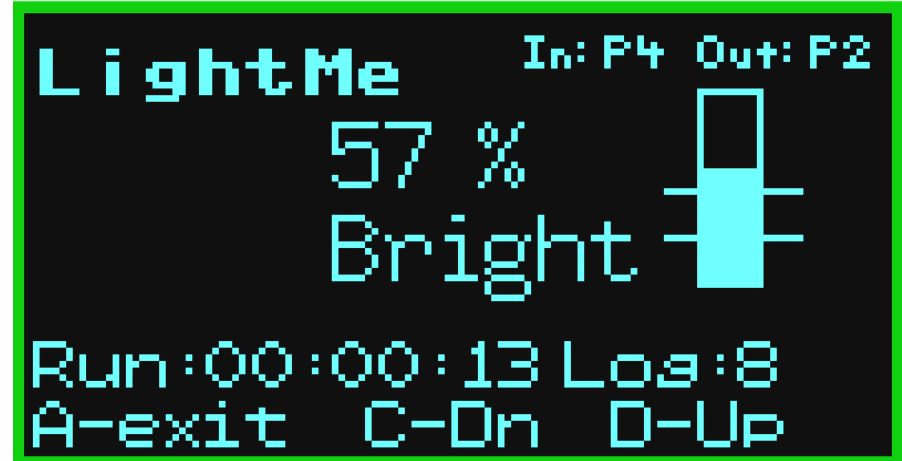
The percentage level of the signal as a proportion of the full voltage available at Pin 4 (Vcc or 3.3 volts) is shown in a vertical histogram (bar) on the screen.

The threshold value of light below which the algorithm will activate the peripheral on P2, is adjustable using Buttons C&D.

The reason for two threshold values is explained in the app description on the website.

The variation in light level over time is also logged and recorded at intervals set in the _config app in a csv file in the Kookaberry's USB memory.

Full details of data logging can be found in the [Tutorial: Data Logging](#) on the Kookaberry website





One solution to the D&T Design Brief

Make a cardboard house following the instructions in next slides

Use the ambient light sensor as the input peripheral and an LED as the output peripheral.

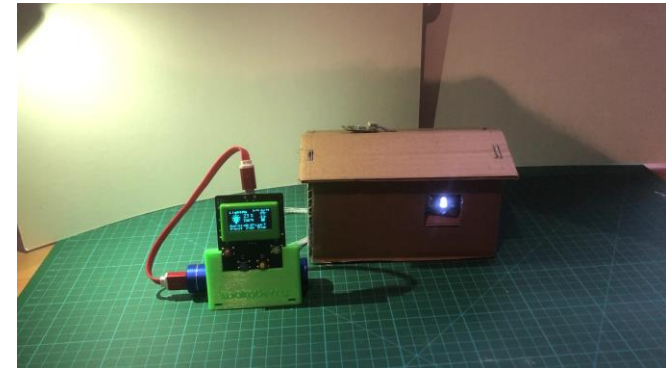
Use BluTack to stick the ambient light sensor inside the window of the house, and the LED to the outside. Plug the sensor into P4 and the LED into P2

Turn on the Kookaberry, find the LightMe app in the Menu and press Button B

If the ambient light sensor is collecting too much light to simulate enough darkness to turn the LED on, then there are three alternatives

- Dim the classroom lights
- Adjust the threshold levels using Buttons C&D, or (possibly the easiest way), cover the sensor with a piece of paper or cloth. Try different grades

To simulate sunrise, remove the covering or shine a light on the sensor. Be creative.....





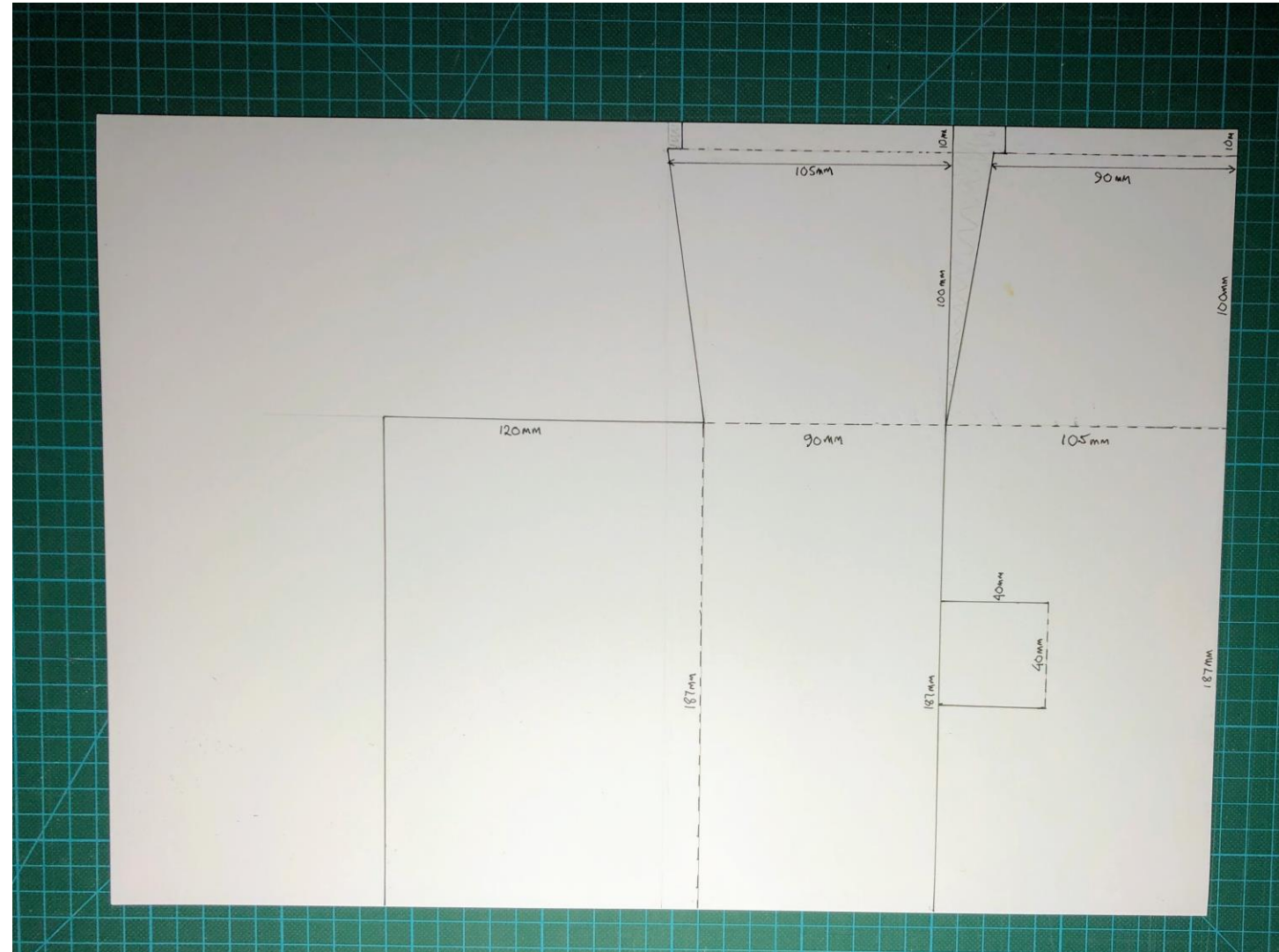
Cutting out the House

The cardboard used for the house is best sourced from A3 sheets of Quill Thick Board, 600gsm. These can be found at Officeworks.

This grade of cardboard can be easily cut with scissors.

Cut along the solid lines and score along the dotted ones

One house can be made out of one A3 board.



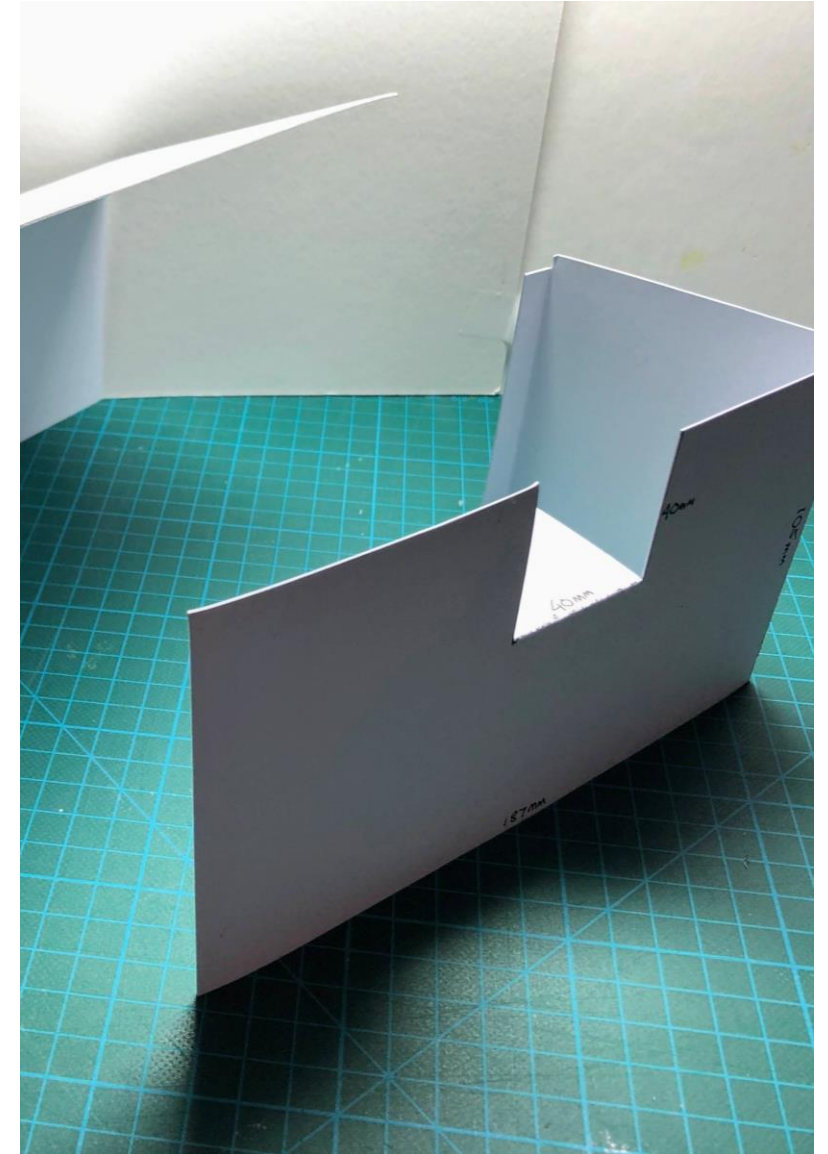
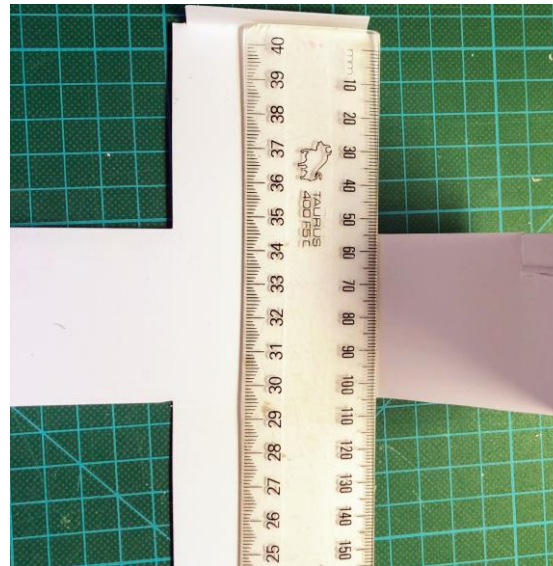
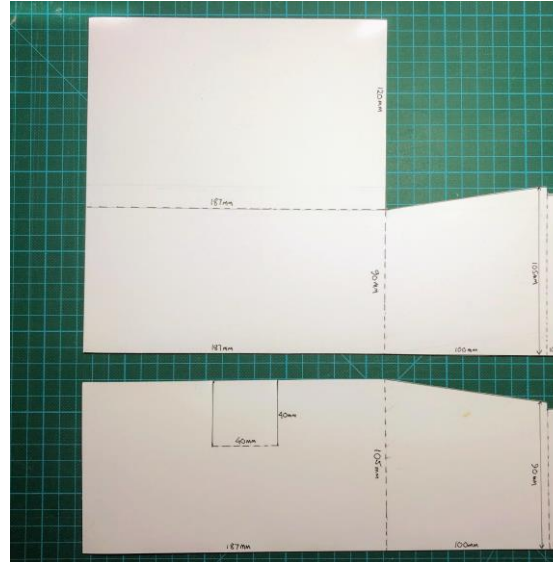


Making the House Pt 1

Score along every dotted line on the same side, then turn over and bend the cardboard over against the sharp edge of a ruler

Don't score the line of the roof join too deeply as the lid should always be slightly raised for ease of access

Glue the tabs one at a time, keeping the house held against a flat surface as you do so.





Making the House Pt 2

Stick the peripherals to the house with BluTack as shown

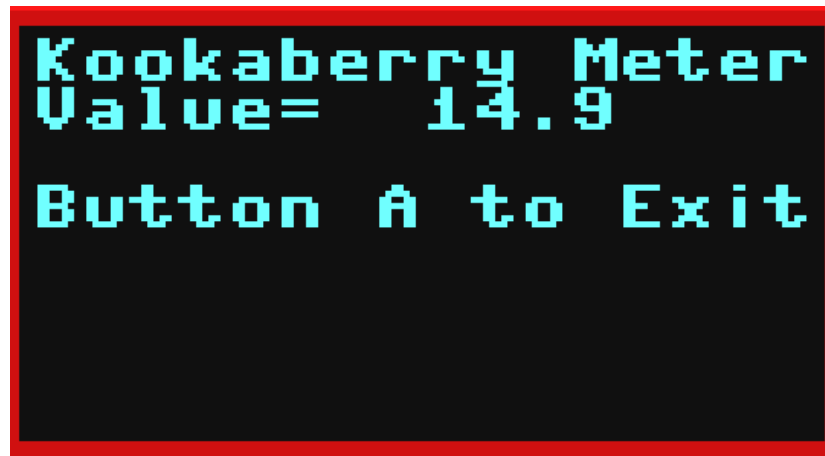
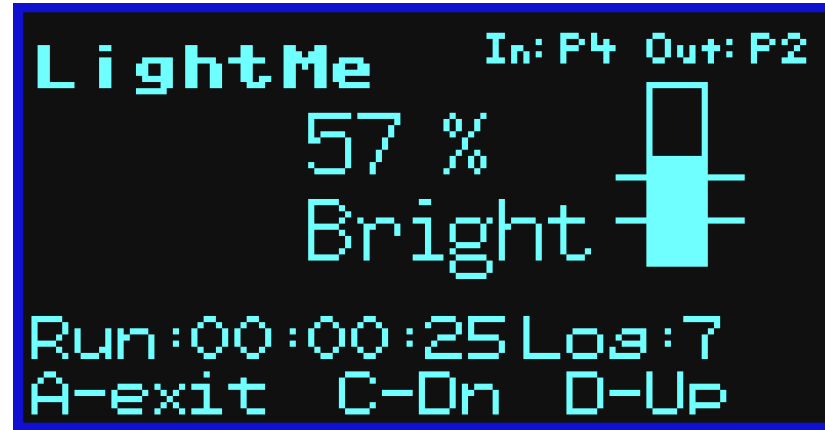




Worked Solution for the Project's Digital Technologies Brief

This solution is included in the Digital Technologies Lesson Plan "Recreating the LightMe App in KookaBlockly"

Find it on the Learning Plans index page on the KookaBerry website





Mapping to NSW Curriculum Years 5/6

SCIENCE & TECHNOLOGY

Skills: Design & Production

Plans and uses materials, tools and equipment to develop solutions for a need or opportunity (ST3-2DP-T) ([ACTDIP019](#)) ([ACTDIP020](#))

([ACTDIP021](#)) ([ACTDIP022](#)) ([ACTDEP026](#)) ([ACTDEP028](#))

Defines problems, and designs, modifies and follows algorithms to develop solutions (ST3-3DP-T) ([ACTDIP017](#))

Technology: Living World

Explains how digital systems represent data, connect together to form networks and transmit data (ST3-11Di-T) ([ACTDIK014](#)) ([ACTDIP022](#))



Mapping to Australian Curriculum Years 5/6

DESIGN & TECHNOLOGIES

Creating Designed Solutions

Investigating & defining

Critique needs or opportunities for designing, and investigate materials, components, tools, equipment and processes to achieve intended designed solutions ([ACTDEP024](#))

Producing and implementing

Select appropriate materials, components, tools, equipment and techniques and apply safe procedures to make designed solutions ([ACTDEP026](#))

Collaborating & managing

Develop project plans that include consideration of resources when making designed solutions individually and collaboratively ([ACTDEP028](#))

DIGITAL TECHNOLOGIES

Digital Systems

Examine the main components of common digital systems and how they may connect to form networks to transmit data. ([ACTDIK014](#))

Creating Digital Solutions

Investigating and defining

Define problems in terms of data and functional requirements drawing on previously solved problems. ([ACTDIP017](#))

Generating and designing

Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration. ([ACTDIP019](#))

Producing and implementing

Implement digital solutions as simple visual programs involving branching, iteration, and user input. ([ACTDIP020](#))

Evaluating

Explain how student solutions and existing information systems are sustainable and meet current and future local community needs. ([ACTDIP021](#))

Collaborating and managing

Plan, create and communicate ideas and information, including collaboratively online, applying agreed ethical, social, and technical protocols. ([ACTDIP022](#))