



# YOUNG ACCELERATORS



# Arduino Tinkercad Self-guided program

Course Overview

2021

## Arduino Tinkercad Learning Overview

Have you ever wondered what's happening within your electronic devices? How do inputs and outputs like buttons, sensors, lights and buzzers talk to each other to create interactive technology?

In this workshop you will play the role of an engineer and explore some of the ways in which electrical equipment and software are connected.

Taught by QUT STEM ambassadors, together we will learn to program an Arduino Microcontroller with Tinkercad and complete a series of hands-on challenges with real world applications.

Throughout this course we will challenge you to build, troubleshoot and program your own electrical circuit. You will learn valuable skills which will enable you to tackle your own microcontroller projects around the home and in your everyday life.

### Program format

Arduino Tinkercad is a nine-part self-guided journey delivered through a series of interactive video recordings. These are designed for you to work through the content at your own pace. Each video chapter is a mix of reading content, listening to audio and watching video. Each week concludes with you applying your new knowledge to create a new electrical circuit and the associated coding for it to run correctly.

We have provided general debugging tips for each project. In addition to this weekly project, there are weekly challenge activities and extension tasks for you to apply your new skills in a different context. There is a downloadable student progress tracker so you can keep monitor your progress towards each learning objective and challenge task.

STEM High School Engagement have set up an interactive and ongoing [Padlet](#) where you can find out how to create a Tinkercad account, access **keyword lists**, **troubleshooting tips**, **coding advice**, **extra resources** and post their completed weekly challenges and collaborate with other students completing the same course. Padlet is free to use.



[Open the Arduino Tinkercad Padlet →](#)

### Recommended course length

Recommended course length is 9 - 10 weeks. With learners spending 20 - 30 mins per week viewing the required course content, followed by a weekly challenge task to apply your acquired skills from that week's lesson. Challenge task suggested timings vary from 15 mins to 1 hour. See Table 1 for recommended learning times.

Total learner activity time (approx.) = 10 to 12 hours

**Table 1: Online module weekly guided learning hours**

Lesson/ Week	Content	Minimum required viewing time	Suggested challenge activity timing	Maximum weekly learning time (approx.)*
1	Introduction to TinkerCad	24 mins	15-20 mins	45 mins
2	Introduction to Arduino	32 mins	30-40 mins	1 hour 10 mins
3	Colours and Lights	29 mins	45-60 mins	1 hour 30 mins
4	Loops in Coding	20 mins	45 mins	1 hour
5	Conditional Statements	28 mins	30-40 mins	1 hour 10 mins
6	Buzzers and Switches	20 mins	30-40 mins	1 hour
7	LCD Screens	24 mins	40-60 mins	1 hour 20 mins
8	Sensors	21 mins	30-40 mins	1 hour
9	A Final Project	19 mins	N/A	20 mins

\*Note these are suggesting learning times, times may vary per individual student.

## What you will learn

On completion of this course, you will be able to:

- Identify the basic structure of a circuit and explain how a breadboard works. Be able to implement Tinkercad and create a circuit and justify component placement and connections on a breadboard.
- Understand how a pushbutton works and its potential applications. Identify the difference between setup and loop in Tinkercad. Implement the code editor and justify component and pin connections to the values used in the code. Evaluate the use of microcontrollers and how they apply to real life.
- Describe the basics of Morse code and its functionality. Define what RGB lights are and their applications. Investigate how an RGB light works and what further applications this could have. Test the code editor and its application when you have multiple pins.
- Explain and generate 'for and while' loops. Recognise when to apply 'for and while' loops in Arduino and consider their applications.
- Define how 'if', 'else if' and 'else' conditional statements work. Identify what operators are and be able to apply them with conditional statements. Implement conditional statements appropriately. Justify the importance of conditional statements in coding and recognise how similar they are to human decision making.
- Identify a slide switch. Explain how a slide switch works. Distinguish as to why a slide switch may be preferred over a button and apply the use of buzzers or Piezo Audio Amplifiers in Arduino.
- Explain what an LCD is, identify situations where an LCD is useful and be able to justify why in some situations an LCD is not the best output choice.
- Explain why sensors are useful, describe what an ultrasonic distance sensor is, judge when an ultrasonic distance sensor is useful and appreciate how many electronic devices use sensors such as an ultrasonic distance sensor to make our lives easier.
- Discuss why electronic devices have so much potential. Identify that most of our electronic devices are combinations of smaller electrical devices. Recognise that even more electronics can be created using Arduino Tinkercad and reflect on creating electronics and how this is not just limited to Arduino Tinkercad and that there are many more real-world applications.

## Why learn Arduino and Tinkercad?

Arduino is an open-source electronics and coding platform that allows anyone to build and program all kinds of devices. Arduino can help you build simple electrical devices that allow you connect all kinds of wires and components together to make both simple and complex machinery. By utilising Tinkercad to build your electrical devices you can create your projects online without needing physical circuits and access a range of projects, resources and further learning opportunities.

Soon enough you will be able to create your own projects like a motion-activated alarm system, a robotic arm or a weather reader.

Arduino and Tinkercad are important skills for the 21<sup>st</sup> century and help you with critical competencies like critical thinking, innovation, entrepreneurship, communication, creativity, collaboration and digital literacy.

## Study and career options for future coders

By understanding the basics of coding you can explore an exciting study options and careers in coding and programming. Coders and programmers work in a wide range of industries and QUT has a range of courses in computer science and information technology including:

- [Information Technology](#)
- [Data science and analytics](#)
- [Engineering](#)
- [Games and design](#)
- [Mathematics](#)
- [Science](#)

Link to the [Padlet](#) for more study and career information for future coders and programmers or visit [www.qut.edu.au/study](http://www.qut.edu.au/study)

## Contact us

If you have any questions or comments about this resource or any of our other programs, please get in touch.

- Email [stemschools@qut.edu.au](mailto:stemschools@qut.edu.au)
- Subscribe to the STEM High School Engagement [mailing list](#)
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