Sample virtual program:

### Virtual Arduino coding using Tinkercad

Students complete a series of online Arduino coding activities. These can be completed independently or as a teacher guided activity depending on student ability.

**Stage 4 Technology Mandatory**

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| Teacher Information | Elaboration |
| What are your students going to learn? (Objectives) | **TE4-4DP** designs algorithms for digital solutions and implements them in a general-purpose programming language  **Producing and implementing**  Students:   * implement and modify programs involving [branching](javascript:void(0);), [iteration](javascript:void(0);) and functions in a [general-purpose programming language](javascript:void(0);), for example:   + [microcontroller](javascript:void(0);) |
| How are they going to learn it? (Resources and Strategies) | **Resources**:  Autodesk Tinkercad (including Circuits) <https://www.tinkercad.com/learn/circuits>  How to log into Tinkercar with a Google Classroom (G-Suite) account: <https://tinkercad.zendesk.com/hc/en-us/articles/360015757653-I-use-Google-Classroom-how-can-we-sign-into-Tinkercad-with-our-Google-accounts->  Autodesk YouTube tutorial playlist: <https://www.youtube.com/playlist?list=PLV6cmKvnKRs5geApVORPW79U6s3wpa0Ht>  **Strategies**  Teachers share each of the Tinkercad Circuits YouTube tutorial videos on their school’s preferred LMS (Google Classroom, Moodle, Class OneNote).  Instructions given to students to view the video and create their own version of each the circuit in Tinkercad Circuits and code with Arduino general purpose programming language.  Independently, students produce their own version of the virtual circuits in Tinkercad Circuits.  Students use the ‘Share’ feature in Tinkercad Circuits to send their complete virtual circuit to their teacher for evidence of completion and feedback.  Individual activity/reflection: Written student reflection response included with each virtual circuit when submitted. Student’s to reflect on what worked well, what was challenging and how this circuit and code could be used in a Technology project. |
| Target date for completion | Approximately one week. |
| How are you going to know that they learned it? (Success criteria) | Students can demonstrate understanding of the code, the function it preforms and possible project applications evidenced in the written reflection activity.  **Activity 1: Blink an LED With Arduino in Tinkercad (Output)**  Students begin with learning how to blink an LED (light emitting diode) using Arduino’s digital output in Tinkercad Circuits. They will connect an LED to the Arduino Uno and compose a simple program in both block code and general purpose coding language to turn the LED on and off. Students use the share function to create a link of their circuit and code to submit to their teacher, including a written reflection of what worked well, what was challenging and how this circuit and code could be used in a Technology project.  <https://youtu.be/yyG0koj9nNY>  **Activity 2: LEDs & Breadboards (Output)**  Students learn how to control multiple LEDs using Arduino’s digital outputs and a breadboard. Expanding upon the last lesson on blinking an LED, they will connect some LEDs to the Arduino Uno and compose a simple program to light them up in a pattern. Students use the share function to create a link of their circuit and code to submit to their teacher, including a written reflection of what worked well, what was challenging and how this circuit and code could be used in a Technology project.  <https://youtu.be/MojSo7OtF9w>  **Activity 3: Fading LED (Output)**  Students learn to adjust an LED's brightness using one of the Arduino's analogue outputs. Previously they learned how to use Arduino's digital i/o pins to send HIGH and LOW signals to an LED, but some of these pins are capable of simulating a signal somewhere in between. Students use the share function to create a link of their circuit and code to submit to their teacher, including a written reflection of what worked well, what was challenging and how this circuit and code could be used in a Technology project.  <https://youtu.be/X8dHbdhnGKY>  **Activity 4: RGB LEDs (Output)**  Students learn how to control multi-colour LEDs using Arduino’s analogue outputs. They will connect an RGB LED to the Arduino Uno and compose a simple program to change its colour. Students use the share function to create a link of their circuit and code to submit to their teacher, including a written reflection of what worked well, what was challenging and how this circuit and code could be used in a Technology project.  <https://youtu.be/YqHkULDmmGU>  **Activity 5: Pushbutton Digital (Input)**  Students learn how to read a pushbutton using Arduino's digital input. They will connect up a simple circuit using a solderless breadboard and use some simple Arduino code to control a single LED. Students use the share function to create a link of their circuit and code to submit to their teacher, including a written reflection of what worked well, what was challenging and how this circuit and code could be used in a Technology project.  <https://youtu.be/PC15jBx2UxI>  **Activity 6: Potentiometer Analog (Input)**  Students learn how to read a potentiometer using Arduino's analogue input. They will connect up a simple circuit using a solderless breadboard and use some simple Arduino code to control the flashing rate of a single LED. Students use the share function to create a link of their circuit and code to submit to their teacher, including a written reflection of what worked well, what was challenging and how this circuit and code could be used in a Technology project.  <https://youtu.be/-EDYMQ9lczA> |
| Collecting evidence of student learning (Verification) | Completed Tinkercad tutorials, evidence in virtual circuits shared with the teacher.  Student reflection responses submitted with shared virtual circuits.  Students complete Microsoft Forms or Google Forms to create a self-marking quiz |
| Differentiation | Students work through tutorials at their own pace.  Website versions on the tutorials listed in the YouTube video descriptions.  Teachers can model circuit creation using a shared screen presentation |
| Extension/HPGE | Students include other components and features to their virtual circuits and can correctly code to ensure function.  During feedback for early finishers, teachers challenge students to modify their virtual circuit with additional components and change the functionality of the virtual circuit through modifying code.  Those students who gain an understanding of Tinkercad Circuits can attempt further projects from the Autodesk Tinkercad Circuits Project Library: <https://www.tinkercad.com/learn/project-gallery;collectionId=OMOZACHJ9IR8LRE> |
| Feedback (Evaluation) | Format to be communicated clearly by teacher, whether it is by emailing comments or annotations on documents, upload of media/audio via online platforms or a blended approach. For example, teacher provides feedback on submitted virtual circuit layout and code. Questioning used to ensure understanding of implementation and modification of code.  Teacher uses Microsoft Forms or Google Forms to create a self-marking quiz to test student understanding of features and functions of the Arduino general purpose programming language. |
| Communication | Teachers are able to gauge the progress of the tasks via the schools online platform. Submission dates for each task may be useful as opposed to one final due date.  Students can pose questions/clarifications directly to teacher via email or online platform  Scaffolds for each coding task may be posted by the teacher to help clarify specific requirements for each activity. |

**Resources**:

Autodesk Tinkercad (including Circuits) <https://www.tinkercad.com/learn/circuits>

How to log into Tinkercar with a Google Classroom (G-Suite) account: <https://tinkercad.zendesk.com/hc/en-us/articles/360015757653-I-use-Google-Classroom-how-can-we-sign-into-Tinkercad-with-our-Google-accounts->

Autodesk YouTube tutorial playlist: <https://www.youtube.com/playlist?list=PLV6cmKvnKRs5geApVORPW79U6s3wpa0Ht>

Autodesk Tinkercad Circuits Project Library: <https://www.tinkercad.com/learn/project-gallery;collectionId=OMOZACHJ9IR8LRE>