



EduTrend Contents

EDUTECH · ROBOTICS RESOURCES FOR TEACHERS · MIDDLE SCHOOL

Simulate Before You Build

Build and code an Arduino circuit in a free browser simulator

Ages 11–14

Level: Intermediate

60 minutes

Pairs · up to 30

Activity 03

Inside: activity at a glance · step-by-step session plan · facilitator notes · 3 student worksheets · assessment checklist

ACTIVITY 03 · AT A GLANCE

Simulate Before You Build

Pairs open a free browser circuit simulator and build a virtual Arduino circuit with an LED, a resistor and a push button on a breadboard. They write code so the LED lights while the button is pressed, then extend it to toggle or blink. They discuss what simulation lets them test safely and what real hardware adds.

Learning outcomes

By the end of the session students can:

- build a virtual circuit;
- write Arduino code;
- test and debug in simulation;
- compare simulation and hardware.

KEY WORDS

simulator · Arduino · breadboard · resistor · digital input · output

CURRICULUM LINKS

Science: electric circuits.

Computing: input and output. D&T: electronics.

1**SENSE**

What can it detect?

2**THINK**

What should it decide?

3**ACT**

What should it do?

4**TEST**

Run it

5**DEBUG**

Find and fix

6**IMPROVE**

Make it better

Materials (per pair)

- Devices with a browser
- Free circuit simulator account (teacher-managed)
- Worksheets 1, 2 and 3

Before the session

- Set up class accounts.
- Prepare a starter circuit.
- Print a wiring guide.
- Print worksheets.

SAFETY

Use teacher-managed accounts. In real circuits, always use a resistor with an LED.

ACTIVITY 03 · SESSION PLAN

Step by step

Simulators let pupils test code before hardware is free and without risking components.

Time	What happens	Say or ask
0–8 min Hook	Show a simulated circuit.	<i>"Why simulate first?"</i>
8–25 min Build	LED and resistor circuit.	<i>"Why the resistor?"</i>
25–40 min Code	Button controls LED.	<i>"What does digitalRead return?"</i>
40–52 min Extend	Toggle or blink.	<i>"What changed in the code?"</i>
52–60 min Compare	Simulation versus hardware.	<i>"What can't a simulator show?"</i>

CHALLENGE CARD (print or copy onto the board)

Build and code a simulated Arduino circuit where a button controls an LED, extend it, and explain the value and limits of simulation.

ACTIVITY 03 · FACILITATOR NOTES

The teaching know-how in brief

A resistor limits the current through an LED to protect it. A push button connected to a digital input gives HIGH or LOW, which the program reads to decide what to do.

Browser simulators let students build and code circuits without hardware, testing ideas safely. Real hardware adds loose wires, noise and component tolerances that simulations may not show.

Common ideas to listen for

- “LEDs do not need resistors.” They can burn out.
- “If it works in simulation, it will work in real life.” Real parts vary.
- “A button gives a number.” It gives HIGH or LOW.

Adapting the activity

Support

Provide the circuit ready-built.

Stretch

Add a second button and LED.

WORKSHEET 1

Circuit

Name: _____

Class: _____ Date: _____

List connections.

Circuit

Component	Connected to
LED	
Resistor	
Button	
Arduino pins	

WORKSHEET 2

Code tests

Record tests.

Code tests

Test	Expected	Actual
Button pressed		
Button released		
Extension		

WORKSHEET 3

Simulation or hardware?

Compare.

What simulation helps with and what it misses

FOR THE TEACHER

Assessment checklist

Use during the session. One sheet covers up to eight students; copy as needed.

Student	Builds circuit	Codes input and output	Evaluates simulation

Suggested codes: W = working towards · E = expected · G = greater depth

ABOUT THIS ACTIVITY

Simulate Before You Build is a sample activity from the EduTrend Contents Edutech Robotics Resources for Teachers programme (middle school, level: intermediate). Every activity in the programme follows the same format: a practical challenge, a clear session plan, facilitator notes and ready-to-print worksheets, so that teachers, club leaders and parents can run it without extra preparation.

Full 15-, 20- and 32-week programmes are available from EduStore at edutrend.org.