STEAM4AUT

STEAM and micro:bit for inclusive education

Consortium:

S.T.E.M EDUCATION CYPRUS PRIVATE INSTITUTE

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What is STEAM Education

STEM education integrates Science, Technology, Engineering, and Mathematics, emphasizing critical thinking, problem-solving, creativity, and collaboration. Through hands-on activities and projects, students apply their knowledge across disciplines to address real challenges.

STEAM education adds Arts to the STEM framework, emphasizing creativity, innovation, and aesthetic appreciation alongside scientific inquiry and technical skills. It encourages students to explore connections between art, science, and technology, fostering interdisciplinary thinking and problem-solving.

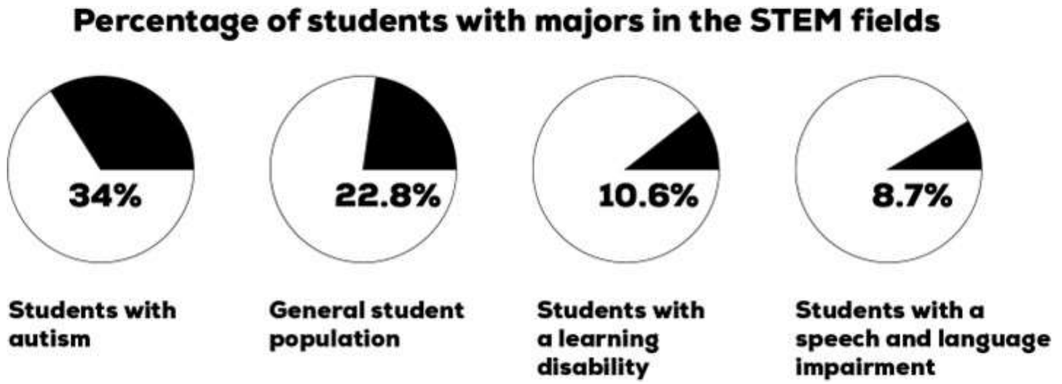
Benefits of STEAM Education

- Strengthening Creativity and Innovation
- Developing Critical Thinking and Problem Solving
- Improving Collaboration and Communication Skills
- Preparing for the Future
- Strengthening Self-confidence
- Interdisciplinary Learning
- Encouraging Lifelong Learning
- Promoting equality in education

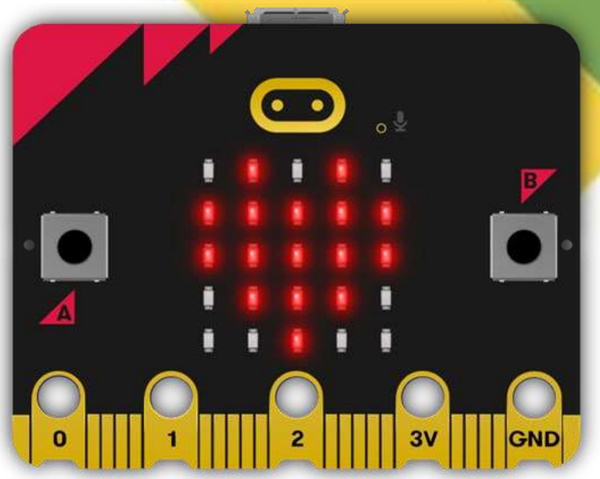
STEAM and Autism

Students on the Autism Spectrum have a predisposition toward science and math because they rely on rules, memorization, and computation easily in their minds (Moon, Todd, Morton, & Ivey, 2012)

Difficulties with STEM content are presented in the form of the ability to develop higher order thinking skills, finding relationships between subject areas, collaborative work, and problem solving (Basham & Marino, 2013)



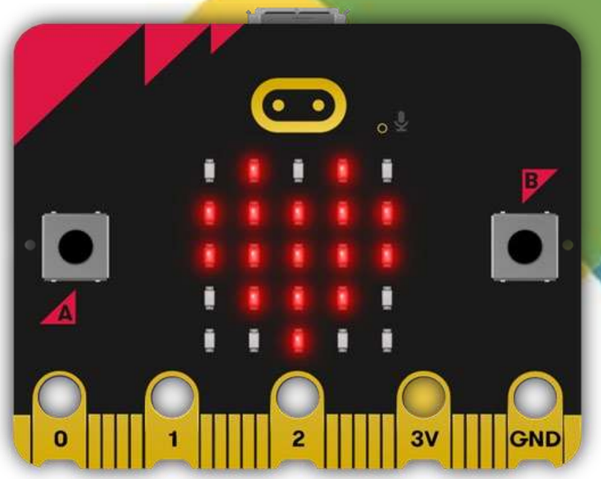
What is a BBC Micro:Bit?



The micro:bit is a pocket-sized, lightweight, open-source programmable microcontroller (small computer).

It was designed with the goal of introducing young students to computer programming and digital technology. The micro:bit provides a simple and accessible platform for learning about coding, electronics, and creative problem-solving and activities related to Science, Technology, Engineering, Arts, and Mathematics - STEAM.

BBC micro:bit Key features

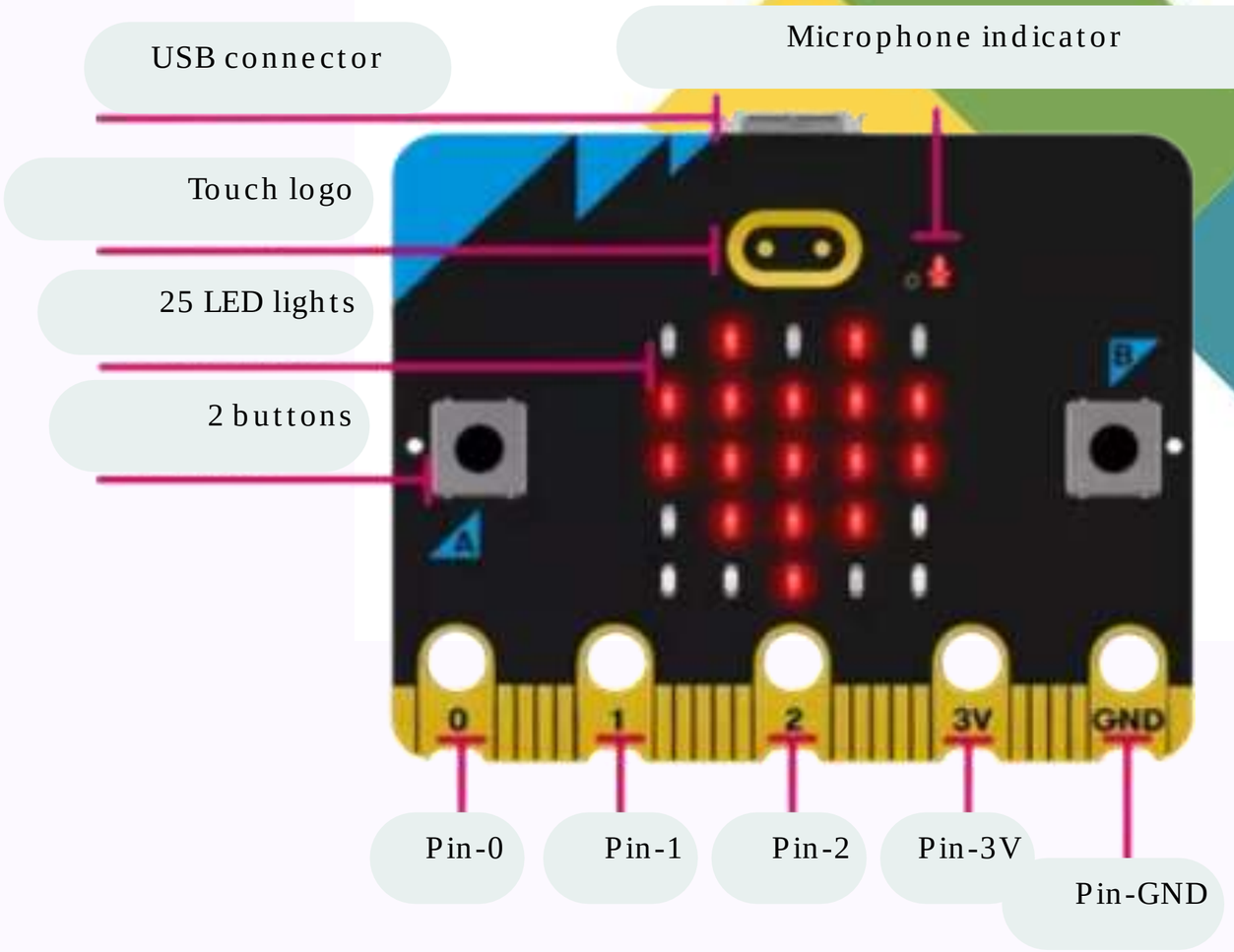


- Buttons: two programmable buttons (A and B), a touch logo
- Connectivity : wireless communication via Bluetooth
- Programming languages: block -based (e.g MakeCode) or text - based (MicroPython and JavaScript).
- Accessories : pins on the bottom allow accessories to be connected.

The mico:bit can be plugged into a computer via USB or accessed via an online app. To make it portable a battery pack can be connected.

Micro:bit feautures:

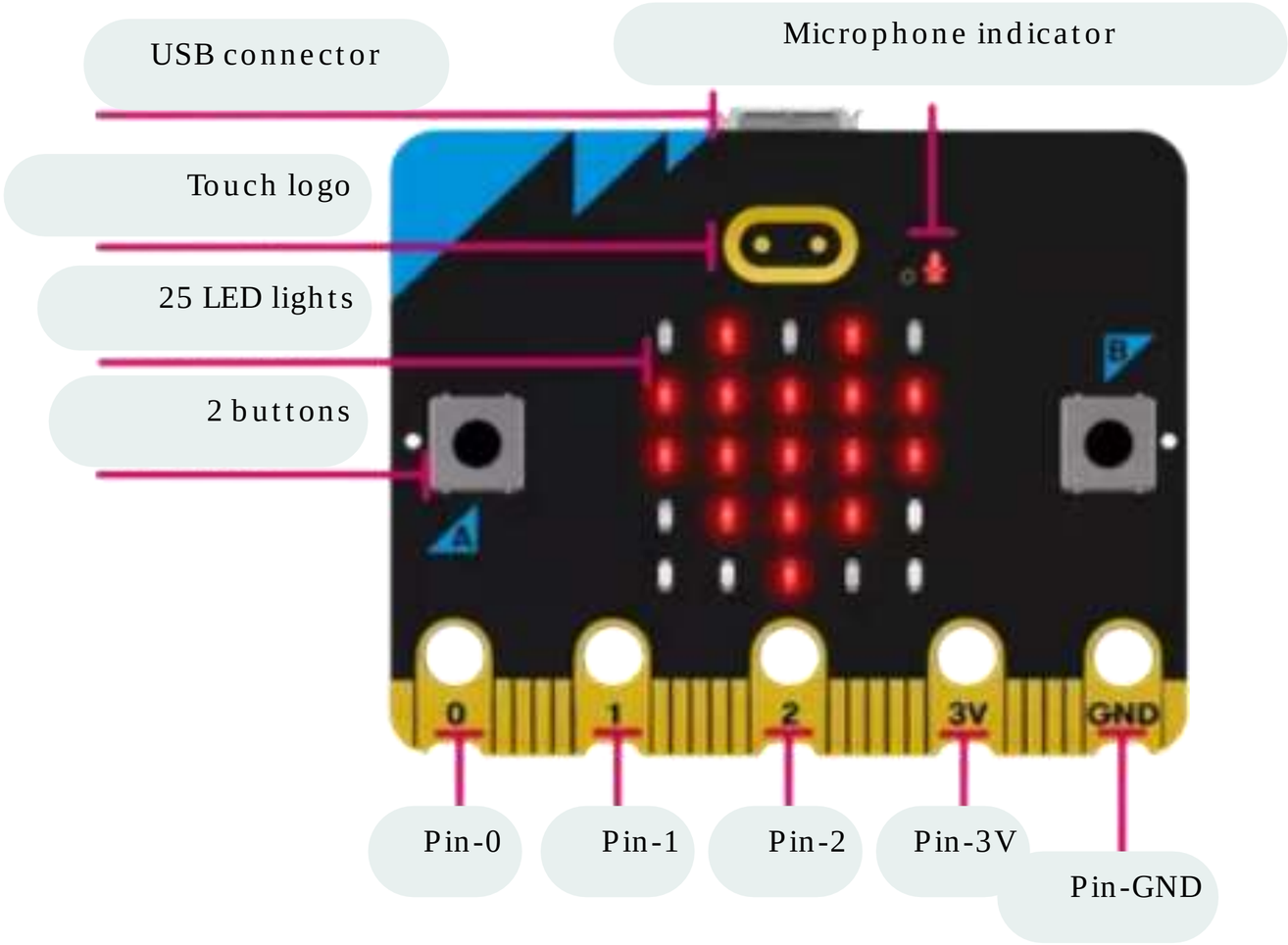
Micro USB Socket - connect the micro:bit to a computer or laptop, that allows the micro:bit to have programs transferred to it.
Microphone - a has built-in microphone. The microphone LED will light up if the microphone is measuring sound levels. The microphone LED also indicates where the microphone is located.
Touch sensor - the gold logo also works as a touch sensor. It can be used as an extra button in your programs.



Micro:bit features:

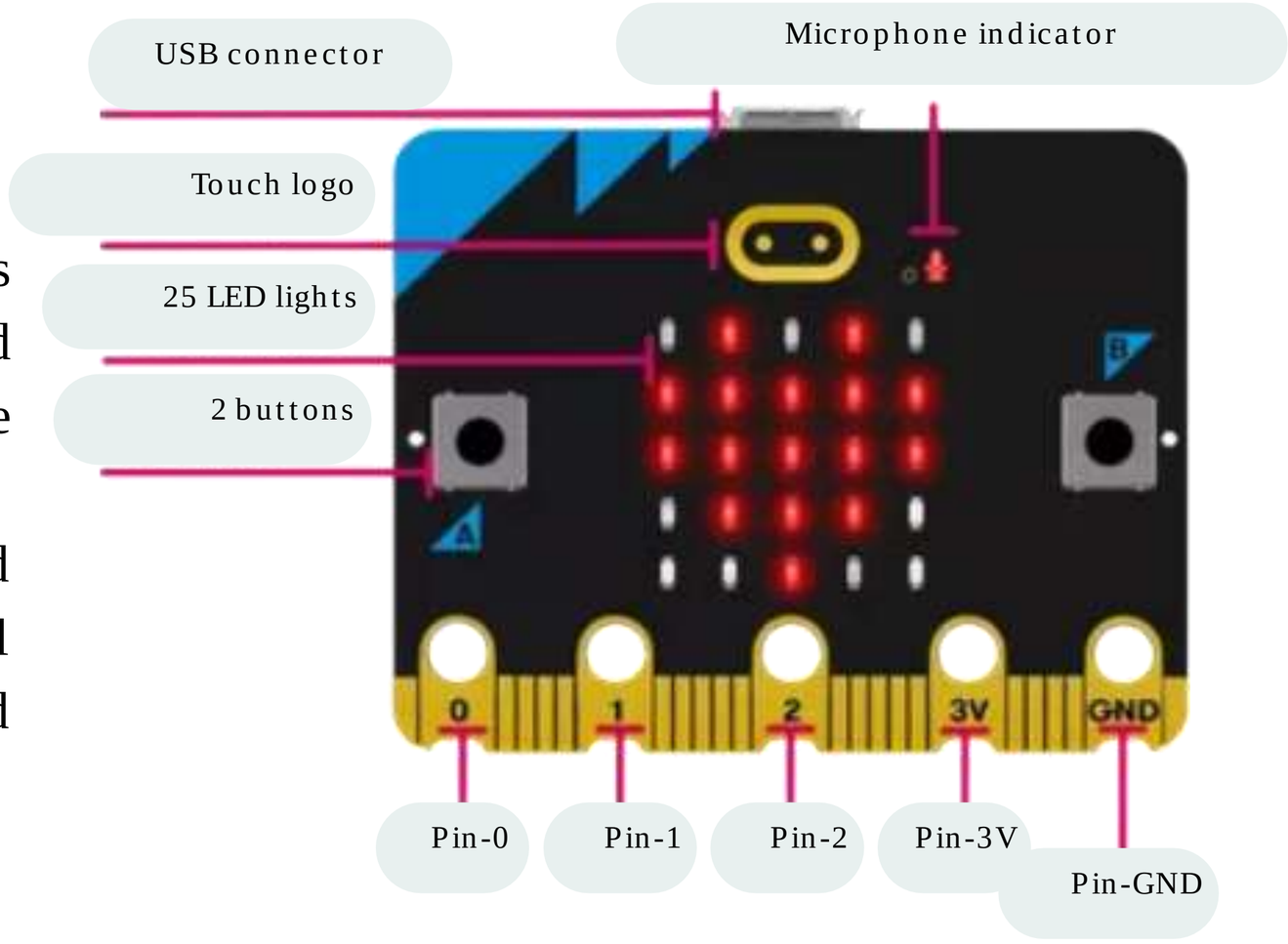
LED Display and Light Sensor - 25 LEDs arranged in a 5x5 grid. The LEDs can be used for displaying pictures, words and numbers. They can also act as sensors and measure light levels.

Buttons - two buttons, A and B, on the front. The buttons can be pressed separately or together. Pressing the buttons can be used to trigger code.



Micro:bit feautures:

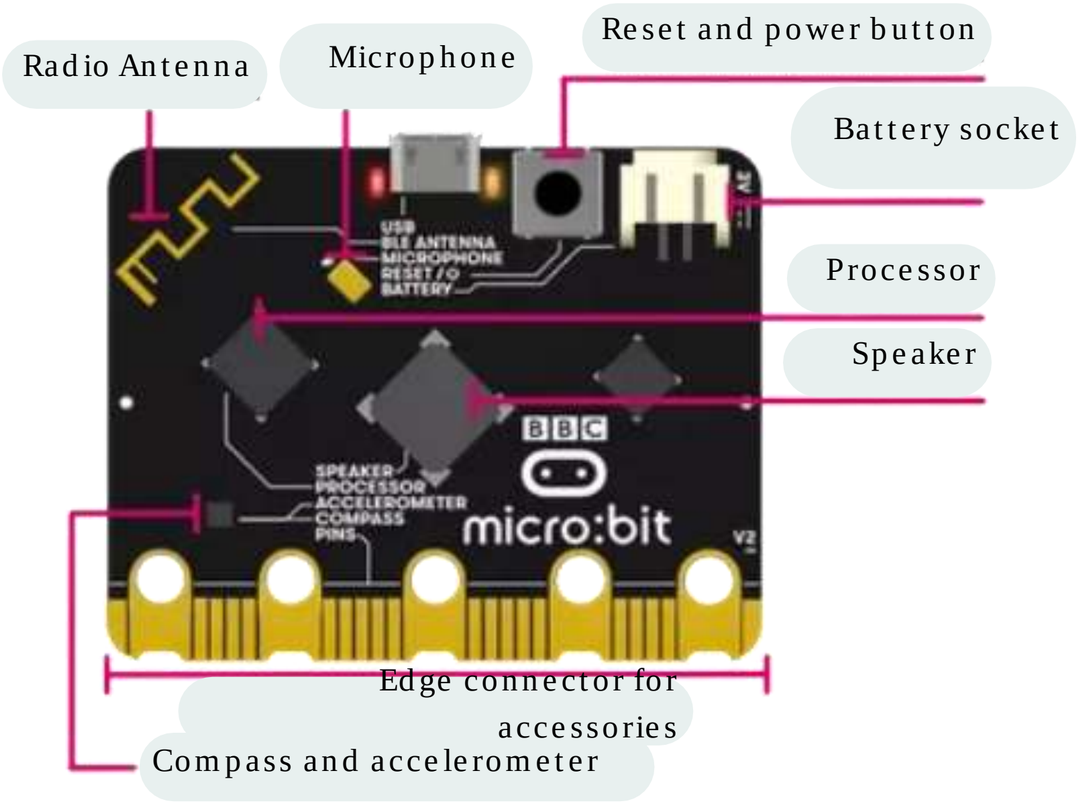
Input and Output Pins - micro:bit contains small holes on the edge. These are called pins and these pins can be split into three categories: GPIO; 3V power; and GND.
The pins can be used to create circuits and physically connect the micro:bit to external things. The 3V and GND pins are connected to the power supply of the micro:bit.



Micro:bit feautures:

Radio and Bluetooth - the micro:bit can communicate wirelessly with other micro:bits using radio waves. Tablets can also connect to the micro:bit wirelessly via Bluetooth.

Reset button - reset the micro:bit or restart a program from the beginning. You can also place the micro:bit into power-saving sleep mode by holding down the button and waiting until the red LED on the left goes dark before releasing the button.

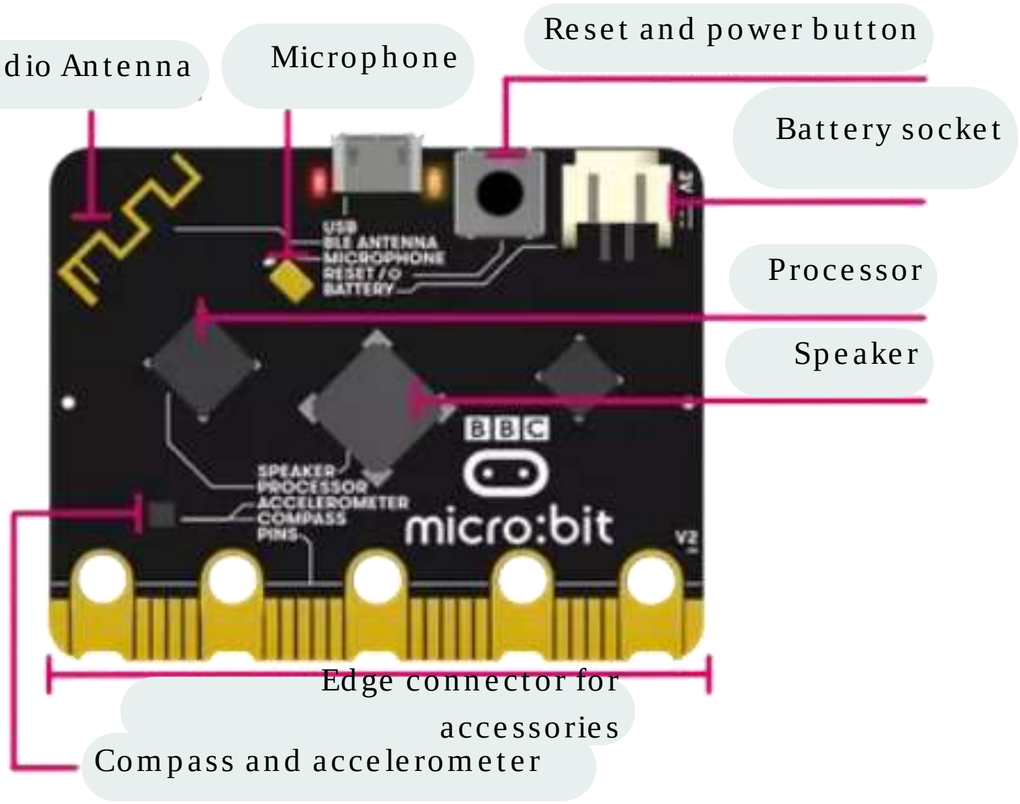


Micro:bit feautures:

Battery - powered using a battery pack. Instead of using a computer to power it, the battery pack can be plugged into the micro:bit.

Processor - contains a microprocessor. A processor is sometimes called the ‘brains’ of a computer. The processor receives the inputs, runs the programs and gives outputs. It fetches, decodes and carries out the instructions coded on an online micro:bit editor.

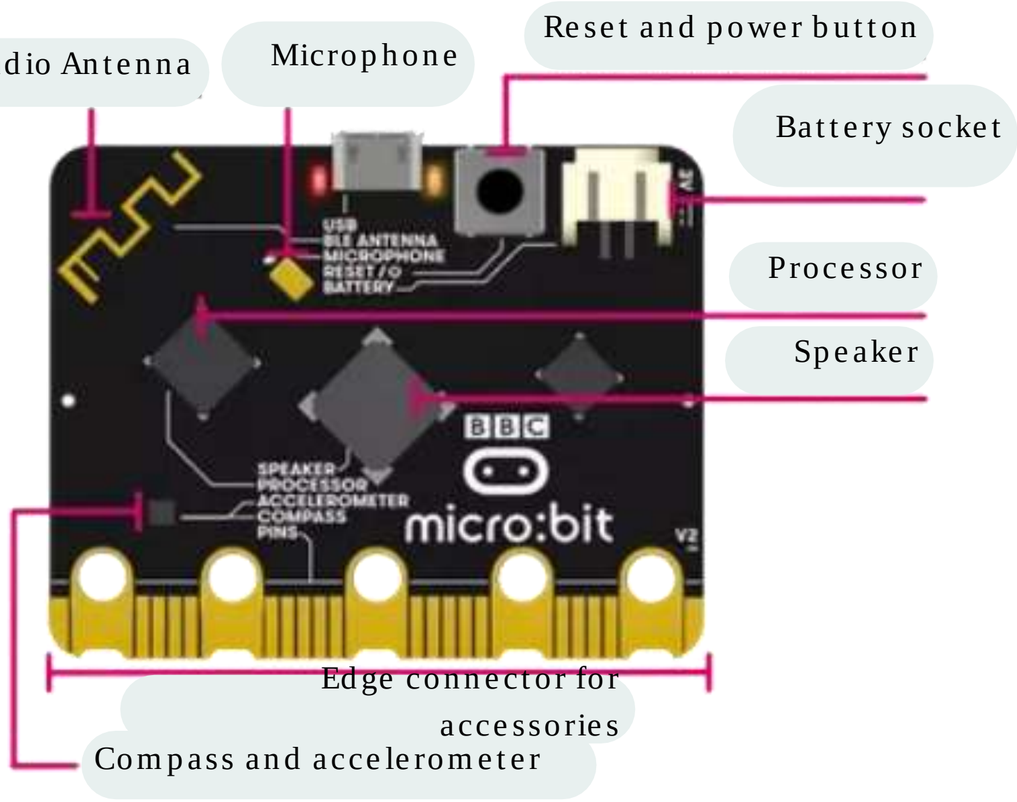
Temperature Sensor - inside the processor that can give you an approximation of the air temperature (Celsius).



Micro:bit feautures:

Accelerometer - contains a motion sensor that measures movement. The accelerometer can detect when the micro:bit is tilted left to right, backwards and forwards and up and down.

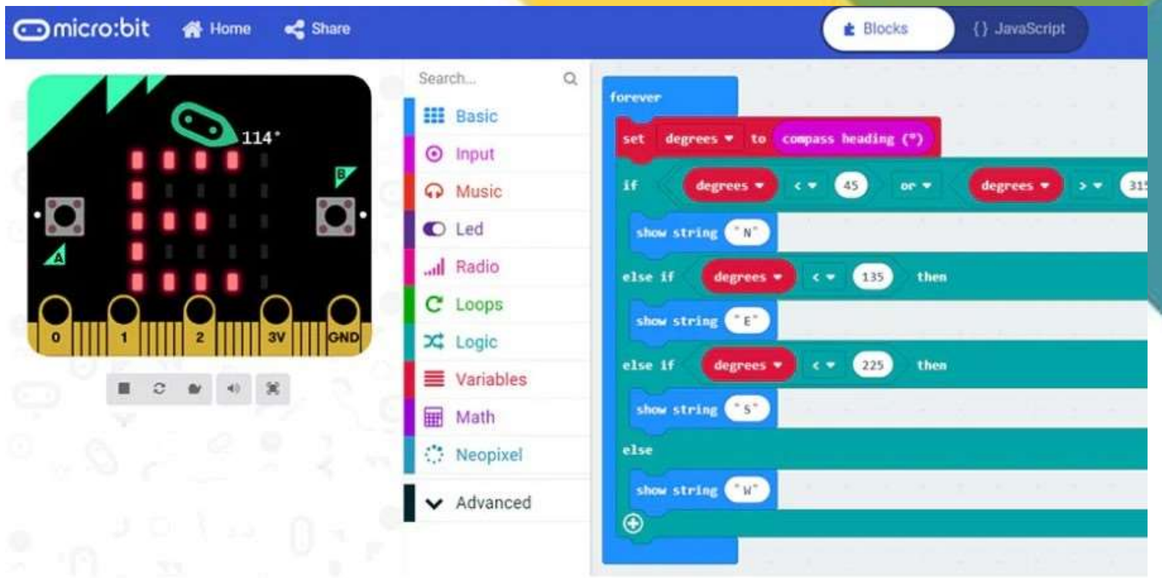
Compass - the micro:bit has a built-in compass that can detect the direction in which it is facing.



What is MakerCode?

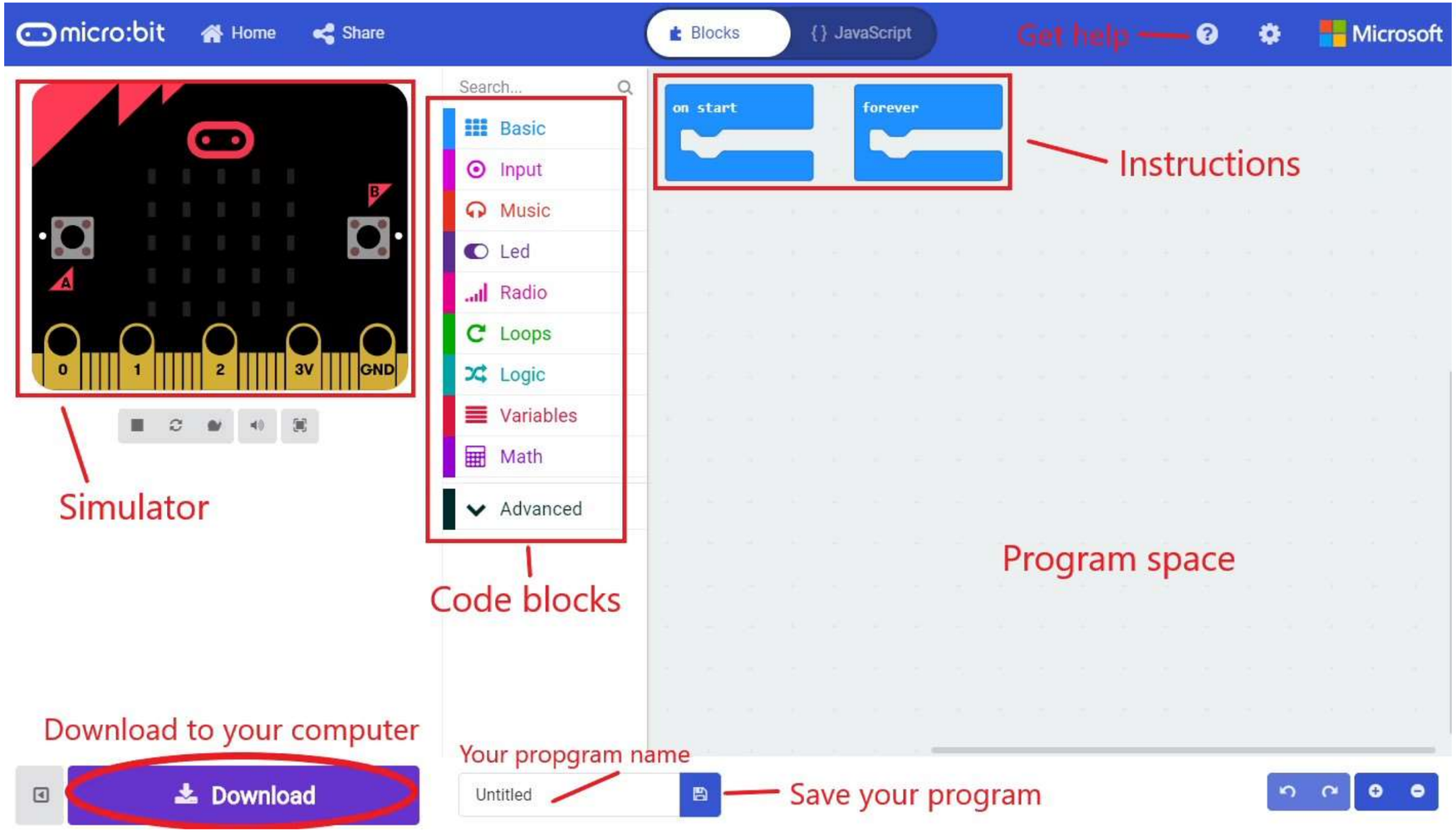
- user-friendly
- web-based platform
- designed for coding and programming education.

It offers a block-based coding interface where users can drag and drop visual code blocks to create programs. The platform supports various devices, including the BBC micro:bit, and features online simulators for virtual testing.

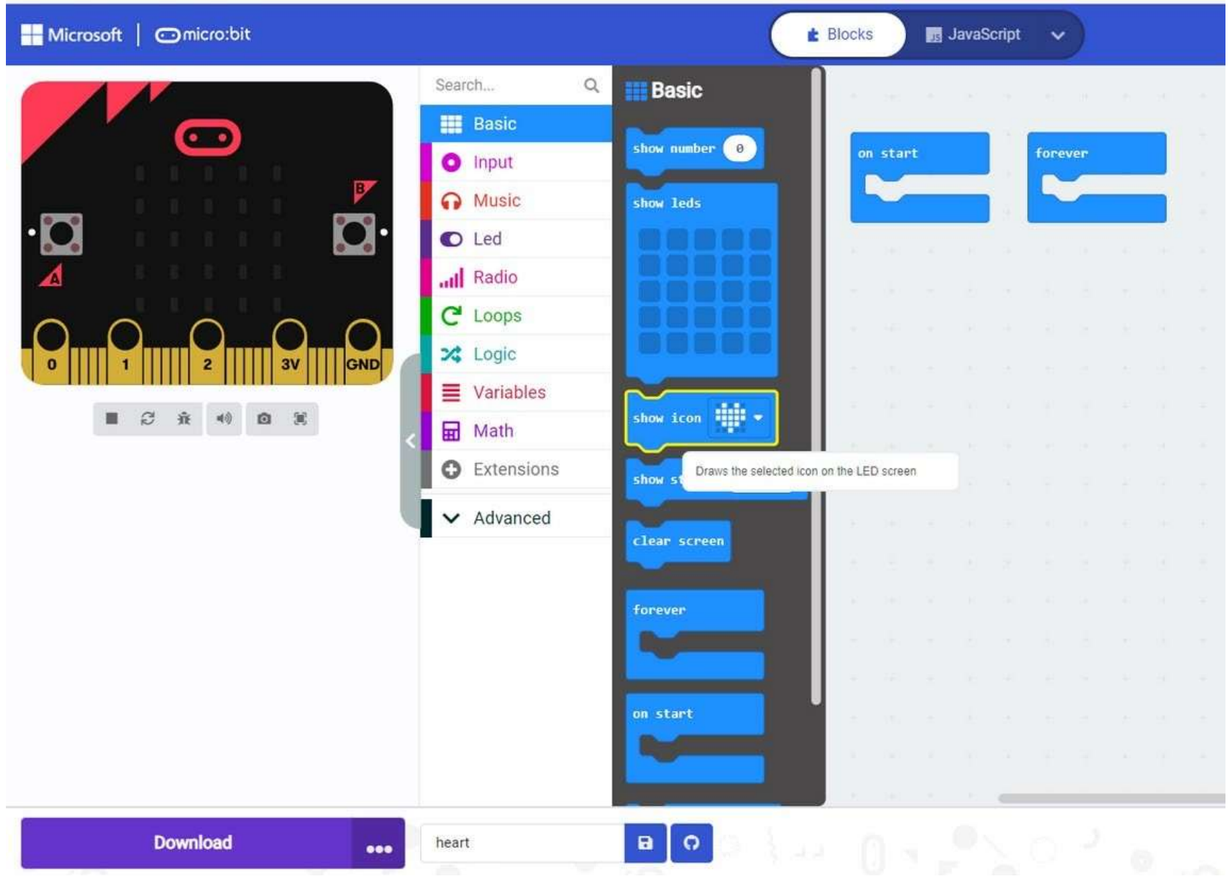


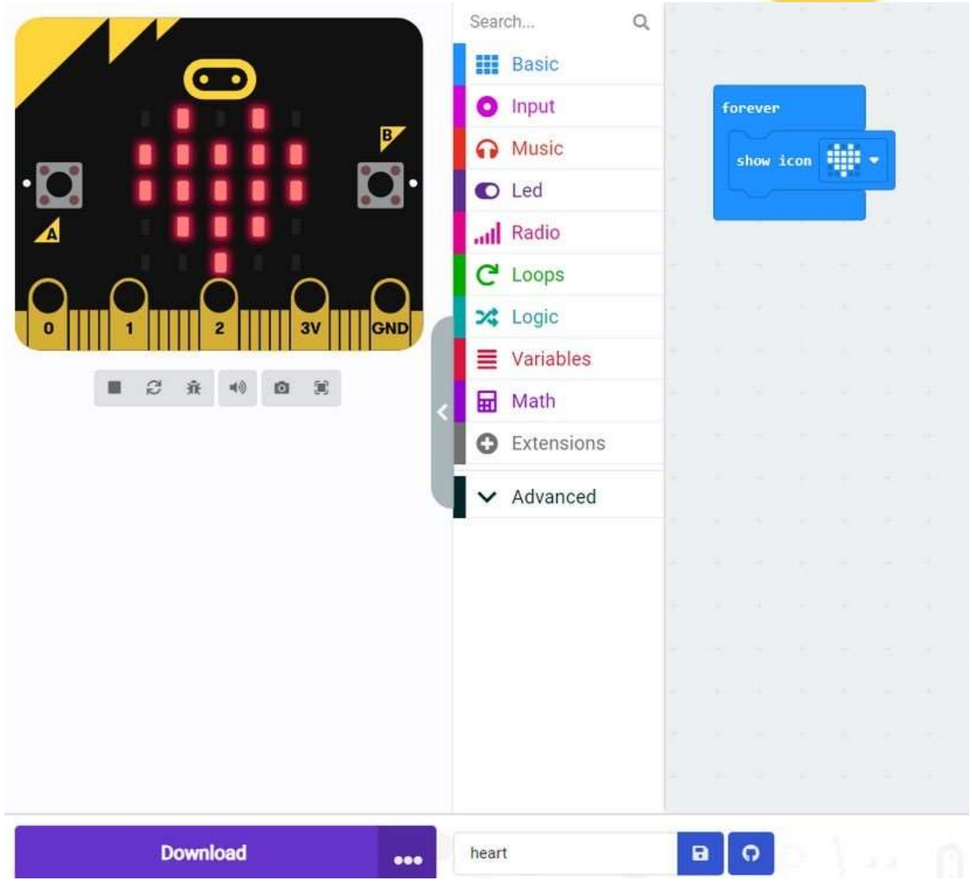
Basic	access to basic micro:bit functionality
Input	events and data from sensor
Music	generation of music tones
Led	control of the LED screen
Radio	communicate using radio packets
Loops	loops and repetition
Logic	logic operators and constants
Variables	variables
Math	more complex operators
Advanced	functions, arrays, text, game, images, pins, serial, control

What is MakerCode?



What is MakerCode?





Teaching STEAM4AUT

Creating educational material suitable for classes with children with autism

Co-funded by the European Union

Successful STEAM Integration for children with autism

Teachers must have a comfort level with the subject, time to plan the curriculum and an understanding of the universal design for developing instructional materials (Basham & Marino, 2013)

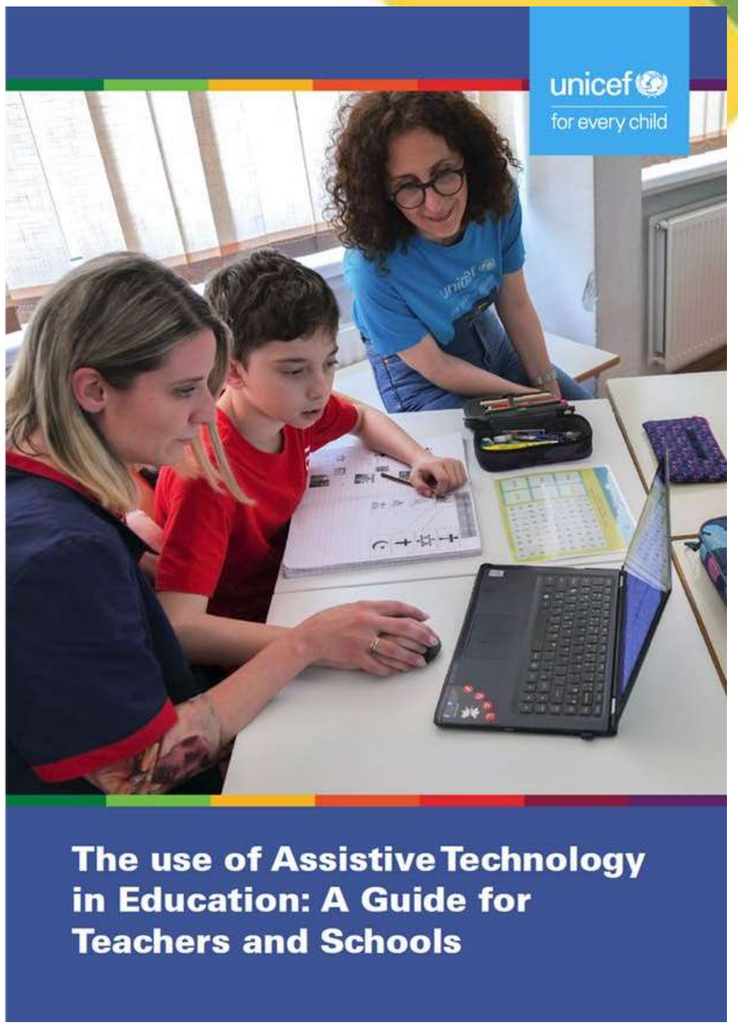
Students on the spectrum will benefit from:

- Visualisation of material
- Time management techniques for breaking down complex tasks into manageable tasks
- Diagrams and graphics to illustrate concepts
- Dictionaries
- Clear brief instructions
- Handbooks
- Discussions and guidelines for completing research techniques
- Distraction-free environments

Important Guide

The use of Assistive Technology in Education: A Guide for Teachers and Schools

The use of Assistive Technology in Education: A Guide for Teachers and Schools has been authored by Katerina Mavrou and under the guidance of the Education Section, UNICEF Regional Office for Europe and Central Asia



Templates

ANNEX 1: AT Assessment for Beginners: Three Steps and Five Tips to Assistive Technology Assessment (Katerina Mavrou)

3 Steps and 5 Tips to Assistive Technology Assessment *AT Assessment for Beginners* *"Flexible, Collaborative, Pleasant, Decision-Making, User-Centered Process"* *The 3-Step Process*	
Step 1: Organize and Prepare:	
Tips: User-Centered & Collaborative	
1.1. ***Collect information***	▪ Previous reports from other professional ▪ Interviews with the student, family, professionals ▪ Observation of student and environment – on and off task
So as to:	
✓ **Define goal(s):** What does **the student wants/needs** to do? (tasks & activities)	
✓ **Define barriers:** Which are the **barriers** that AT is expected to remove?	
✓ **Define needs & abilities:** What **can** the person do? What are the **difficulties** and **issues** to consider regarding all aspects of development (motor, sensor, cognitive, emotional)	
✓ **Define existing AT used:** Does the user already use any **AT**? (what, how, when)	
1.2. ***Set up the team***	▪ Remember: **The student** is part of the team! ▪ Talk to **other professionals** – invite them to the assessment ▪ Get the **family** involved (observe and/or participate) ▪ ***However!*** *Avoid crowded assessment settings – decide who is important to be there*
1.3. ***Prepare the environment***	▪ Define **the venue** where the assessment will take place – Make it **accessible!** ▪ Prepare **the equipment/tools** that will be used for the assessment ▪ Be **flexible**! You may need to change plans!
Step 2: Actual Assessment	
Tips: User-Centered, Collaborative, Pleasant & Flexible	
1.2. ***Be organized***	▪ Follow **well-structured tasks** (mind flexibility!) ▪ Have all **documentation** in hand ▪ Have all **equipment** ready ▪ Allocate **roles** (if needed) with other involved professionals

ANNEX 3: Lesson plan template to facilitate the use of assistive technology for inclusive education

Source: Adapted from SKATE project
Lesson title:
General information:

Time:	
Grade/level:	
Main Objectives: (formulated having in mind the principles of UDL)	
Brief Classroom Description and prior knowledge and experiences of students	**Number of Children** **Children that use personal AT** **Other details**
Materials/Equipment: (Including AT and other technologies)	
Tips	

Learning Activities	Design and approach	Technology / Materials	UDL Principles	Classroom organisation
Introduction (description)				
Activity 1 (description)				
Activity 2 etc (description)				
Assessment (description) (formative/ summative)				

ANNEX 4: Activity Analysis and Mapping for the use of assistive technology towards Universal Design for learning

Analysis of learning activity (adopted by SKATE project)

Learning activity title:		
Context:		
Time:		
Grade level:		
Main Objectives:		
How this activity is related with the lesson plan		
Brief Classroom Description (from lesson plan)	**Number of Children** **Children that use personal AT** **Other details**	
Procedure	**(describe your activity in steps, incl. how you will differentiate by means of UDL and the implementation of ICT(-AT))**	
Classroom organization (describe or draw your classroom)		
Materials/Technology:		
Who is involved or needs to be involved ? (e.g. parents, teacher, special needs educator, ..) + tasks	**Who (name or profession)** e.g. teacher	**Task** e.g. Set up the technology

Educational Material

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Thank you!

For more information:

https://www.steam4aut.eu/

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