Sinapse

AKILLI

Course curriculum
Grounded in Finnish pedagogy

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About the Curriculum

The Akilli Starter Kit Curriculum is the foundation of a structured learning journey in robotics and STEM. Designed around three progressive courses, it introduces students to robotics, sensors, actuators, coding, and web-based control through hands-on, project-based learning. Each course builds on the previous one, nurturing creativity, problem-solving, and future-ready skills.

This document presents a tentative curriculum aligned with a three-term school structure. The actual implementation may vary slightly depending on the cohort and the school's academic calendar.

TERM 1

1. Session: Akilli says Hi - Configuration & Narrative

Assemble the dog and upload the whole remote-control code this acts as an introduction to the robot. We discuss the narratives of what the robot looks like - a pet dog or a mars rover?

2. Session: Akilli Learns to Buzz

Students learn how to connect the board to the computer. They understand key parameters such as pin number and pin mode, along with the main steps: writing block code, converting it into assembly code, and transferring it. They program the buzzer to turn on and off, and create patterns to make the dog buzz.

3. Session: Akilli Learns to Count & Talk

Students learn how the robot can communicate with them and are introduced to the basics of block programming. They explore concepts such as variables and how to use them, as well as loops, sequencing, and logic. By the end of the session, they are able to complete challenges such as printing odd and even numbers or generating a Fibonacci series.

4. Session: Akilli Lights the Way

Students continue learning block programming with a focus on loops and sequencing. They understand how sequencing helps control hardware. By the end of the session, they apply this knowledge to configure the LED Module and program it to blink.

5. Session: Akilli's Light & Sound Concert

Students deepen their understanding of block programming to create patterns of LED lights and buzzers. The high ceiling tasks include fading effects.

6. Session: Akilli senses ambience

Students are introduced to their first sensor by working with the LDR. They learn how the robot can detect light and darkness and respond accordingly.
In this activity, students set up the LDR in the IDE, view its raw values on the Serial Monitor, and define a threshold for darkness. They then use simple if–else logic to display feedback and extend the task by linking the sensor to the buzzer and LED, making the robot react to changes in light.

7. Session: Akilli senses aliens

Students learn the basics of PIR sensors and program the robot to sense motion in its surroundings.

In this activity, The Students initialize the PIR sensor in the IDE, observe its output values when motion is detected or not, and print the results to the Serial Monitor. They also learn how to reset the sensor after each detection to ensure accurate readings.

8. Session: Akilli moves back & forth

Students learn to configure the DC motor and, by the end of the session, move the robot back and forth using a wired connection.

In this activity, The Students practice rotating the motor in both clockwise and anticlockwise directions and then extend this to control all four motors, driving the robot forward and in reverse.

9. Session: Akilli senses touch

Students learn the basics of IR sensors. By the end of the session, they teach the robot to notice when touch is detected.

In this activity, The Students initialize the IR sensors in the IDE, test detection by touch, and print the output to the Serial Monitor, identifying which of the two sensors was triggered.

10. Session: Akilli senses water

Students learn the basics of water level sensors. By the end of the session, they teach the robot to detect water levels.

In this activity, The Students initialize the water level sensor in the IDE, read whether water is present or not, determine the water level, and assess the accuracy of the sensor's readings.

11. Integrated Activity (A1)

Students use the LDR and water level sensors together to control an actuator such as the buzzer or LED. By the end of the session, they understand how the robot can make decisions using multiple inputs.

In this activity, The Students read values from both sensors and combine them using simple logic gates like AND, OR, and NAND to decide when to activate the actuator. For example, the buzzer may sound only if it is dark and water is detected.

12. Integrated Challenge: Showcase Session

Students present the integrated activity they developed in the previous session. They demonstrate how the robot works and reflect on the logic they applied to combine sensors and actuators.

TERM 2

13. Recap session and the configuration.

Students assemble and configure the robot on their own. We discuss narrative and students finish some quick tasks to refresh the basic concepts.

14. Session: Akilli detect distance

Students learn the basics of ultrasonic sensors. By the end of the session, they teach the robot to calculate distance.

In this activity, The Students configure the ultrasonic sensor, read its input, use the readings to calculate distance, and print the results in an organized manner on the Serial Monitor.

15. Integrated Activity (A2)

Students configure the ultrasonic sensor with an LED and buzzer to create responses based on distance. By the end of the session, they program the robot to trigger different buzzing patterns and LED outputs at varying distance ranges.

In this activity, The Students read distance values from the ultrasonic sensor and define thresholds. At each range, the robot reacts differently—for example, a steady LED and short buzzer beep when an object is far, a flashing LED with faster beeps when it is closer, and a continuous buzzer with red LED when very near.

16. Session: Akilli Learns New Angles

Introduction to the servo motor. By the end of the session, students will be able to rotate the servo motor to different angles.

In this activity, The Students explore the servo motor blocks in the IDE, practice setting specific angles, and experiment with linking the servo to sensor input for interactive movement.

17. Integrated Activity (A3)

Students configure the IR sensors so that if the left sensor is tapped the robot looks left and wags its tail, if the right sensor is tapped it looks right, and if either sensor is tapped multiple times it activates the buzzer.

18. Integrated Activity (A4)

Students program the PIR sensor to count detections so that the first motion turns on one LED, the second motion turns on a second LED, and if no motion is detected both LEDs switch off and the count resets.

19. Integrated Activity (A5)

Students program the ultrasonic sensor with the servo so that if an object is detected ahead, the robot turns its head left; if blocked on the left, it turns right; and if all directions are blocked, the LED turns red.

20. Integrated Activity (A6 - A)

Students use the Serial Monitor to simulate a crash test. They connect the ultrasonic sensor so that as an object comes closer, the buzzer increases its frequency, and when the object is very near, the motors switch off. Throughout the activity, the Serial Monitor continuously prints the motor's status.

21. Integrated Activity (A6 - B)

Students physically test the crash test program by assembling the robot and running it through an obstacle course, verifying that the buzzer and motors respond correctly to obstacles.

22. Integrated Activity (A7)

Students integrate all the sensors in the kit and program the robot to read each one simultaneously. The readings from the LDR, PIR, IR, water level, and ultrasonic sensors are displayed together on the Serial Monitor in a clear, table-like format for easy interpretation.

23. Integrated Challenge (A8)

Students integrate all sensors with the servo, RGB LED, and buzzer so all behaviors run at the same time; each actuator responds to multiple sensor conditions, and a clear priority rule (e.g., water > PIR > LDR > IR > distance) resolves conflicts when sensors disagree.

24. Capstone Activity (C1)

Students complete the dog form to operate autonomously: the robot drives straight, makes periodic turns after a set delay, and also turns when it detects an obstacle.

Note: *This session represents the transition from guided exercises to autonomy, where students see Akilli acting independently using sensors and programmed logic.*

TERM 3

25. Recap and configuration

Students assemble the Mars Rover and configure the robot on their own. We discuss narrative and students finish some quick tasks to refresh the basic concepts.

26. Akilli Becomes a Wi-Fi Hub

Students are introduced to Wi-Fi blocks, configure Akilli as a router, and print its IP address.

27. Akilli communicates Wirelessly

Students learn how webpages work and send data from the robot to the computer wirelessly over IP addresses.

28. Web Button to Buzz Akilli.

Students learn to program a button on a webpage and use it to make the robot respond by buzzing.

In this activity, The Students design the button in their own style and experiment with different types of interaction, such as tap or hold, to trigger the buzzer.

29. Akilli's Data check.

Students learn how to receive data from the robot through both wireless and wired connections.

On a button click, the robot sends data wirelessly to the webpage while also printing the same data to the computer via a wired USB connection. Students compare the two outputs for data check.

30. Akilli's Magic switch

Students learn to use a button to activate and deactivate a sensor. On each button click, the webpage either starts showing the sensor readings or stops them.

31. Akilli's Sensor dashboard

Students design their own dashboard to display all sensor readings. They program Akilli to send data either at fixed intervals or only when a change is detected.

32. Akilli's Debugging session

Students are given faulty code for the Mars Rover and are asked to correct it so the rover can complete the activity it was designed to do.

33. Akilli's Control Pad

Students configure a grid of four buttons on the webpage to control Akilli's movement in all directions: forward, reverse, left, and right.

34. Akilli goes Rogue

Students program Akilli to move randomly while avoiding collisions, working together with other robots to keep from crashing into each other

35. Capstone challenge (C2)

Students configure the complete Dog/Rover form on a webpage and control all of its functions wirelessly.

Note: *This session represents the integration of all learning—mechanical assembly, sensors, actuators, and IoT—showcasing full remote control and system-level thinking.*

36. Akilli's Grand Finale

Students present the last challenge, demonstrating the fully configured robot and explaining how they controlled it wirelessly.