

ELECTRONICS: CONCEPTS AND BASIC COMPONENTS

THEME	Project with sensors and actuators
FORMAT	Group (students work in small groups)
PREPARATION TIME	30 minutes
ACTIVITY LENGTH	30-45 minutes
DIFFICULTY LEVEL	high

PEDAGOGICAL GOALS

- To observe electronic devices, reflect on their operation, identify sensors and actuators
- To assemble a circuit on the breadboard, describe its operation, draw the schematic, measure voltage and current

NECESSARY MATERIALS

For each group of students:

- 1 9V battery
- 1 *breadboard*

For the collective of students:

- 1 multimeter
- miscellaneous sensors
- miscellaneous actuators

Preparation:

- Assemble kits with the necessary materials for each group of students

Leading the activity:

- The activity will take place in two stages. In the first stage, a discussion with the whole class on electronic devices will be created.
- In the second stage, students divided into small groups must assemble an electronic circuit. This stage ends with presentation to the whole class of some of the circuits.

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Step 1:

- Start a discussion with the whole class on the topic: electronic devices we know, how they work. See some examples of possible questions:
 - Who can give an example of an electronic device? (pick one of the examples)
 - How does it work?
 - Let's imagine what sensors it has! Which ones?
 - And the actuators?
- Give the example of the refrigerator that turns on the lamp when we open the door. What type of sensor do these refrigerators have? (button) and actuator? (lamp)

Step 2:

- Divide the class into small groups, deliver a breadboard and a 9V battery for each group.
- Ask the groups of students to assemble a circuit on the breadboard, using at least 1 actuator and 2 sensors (they can be the same).
- Ask students to:
 - write down a title for the circuit and a description of its operation, specifying which elements are sensors and which are actuators
 - draw the circuit schematic with the corresponding symbols
 - measure the voltage on the actuator, when it is operating under a certain condition (e.g. button pressed, LDR illuminated)
 - measure the value of the current leaving the battery at this point.

Discussion and reflection:

After completing the activity, create a collective discussion about the day's activities. Here are some sample questions you can ask:

- Ask if any group wants to present its project to the class.
- Ask students to look at their colleagues' circuits and see if they have set up different circuits.
- What did we learn today?
- Taking the example of the refrigerator, some modern refrigerators also have a device capable of identifying whether the door has been open for a long time, giving off an alarm. How does this work? (In this case, in addition to a sensor (button) and an actuator (lamp), there is a mechanism that brings intelligence to the refrigerator, capable of counting the time that the door was open to trigger the alarm. This mechanism is related to a microcontroller, programmed by someone to perform this function. We haven't learned this type of programming yet.)

Credits:

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