

SMART LAB ACTIVITY GUIDE

SILLY WALKS

DESIGN CHALLENGE

Build a robot that moves without wheels.

DIFFICULTY LEVEL

Beginner – no prior experience necessary

MATERIALS

LEGO MINDSTORMS EV3 kit but no wheels allowed

INDONESIAN HIGH SCHOOL CORE COMPETENCIES

Movement (Physics, Year X, 4.1 & 4.3)

SMART LAB DISCIPLINES

Science

Physics of movement

Math

Properties of geometric shapes

Art

Study of movement and form

Technology & Engineering

Building techniques

STUDENT OUTCOMES

- **Introduction to materials:** this activity introduces students to LEGO materials by having students explore and use many different pieces in their kit.
- **Collaboration and creativity:** Students are introduced to an environment where they are encouraged to share ideas and be creative.
- **Basic building skills:** students learn motor attachment, sturdy construction and connections that enable movement
- **Basic programming skills:** students learn how to move motors with the LEGO MINDSTORMS EV3 program
- **Presentation skills:** students practice explaining and presenting their ideas to others
- **Collaborative learning:** every group will have a different design, and the entire class can learn different ways of building with LEGO from sharing their designs with each other.

- **Teamwork skills:** students practice teamwork by working in pairs. This introduction to teamwork will support their future projects that require they work with others.

EXAMPLE SESSION – 70 MINUTES

Introduction: 5 minutes

Put students into small groups (preferably groups of two)
Explain the design challenge

Program: 10 minutes

Explain how to program the motors to run

Build, Test and Refine: 25 minutes

Have students work on the challenge
Encourage students to test their silly walker and refine their design

Present: 10 minutes

Gather the students together and have them place their silly walkers on the floor in a row.
Have the groups start their motors at the same time to enable everyone to observe how the different silly walkers move.
Afterwards, have each group briefly present their silly walker by describing how it was built and how it moves.

Final Remarks: 5 minutes

Explain to students the value of coming up with different solutions and using creativity to solve problems

- For example all fields – science, engineering, business, teaching – require creativity and problem solving

Emphasize the importance of iterative design through testing and refining. Explain how you saw groups build, test and refine their design. These are an important parts of the engineering design process because with each iteration, the design can be improved.

Share: 15 minutes

Groups should take pictures of their design and post pictures and a short description of their silly walker to the website.

POSSIBLE MODIFICATIONS

This activity can be shortened by downloading the Motors.ev3 program onto the EV3 bricks before the start of the activity. Students can run the program which will enable them to control the motors by pressing the different buttons on the EV3 brick. This method is also helpful when computers are not available for students to use to program their robot.

This activity can be used to prompt a discussion about animal movement. Ask students: what animals move similarly to the robots? How do different body parts (for example legs, joints, feet/flippers) influence movement?

POSSIBLE EXTENSIONS

This activity can be extended by having students modify their design for a race. For example, students can think about how to modify their design to:

- Ensure the robot moves in a straight line
- Increase speed or power with gears
- Prevent other robots from winning the race

EXAMPLE SOLUTIONS



The above program moves two motors plugged into port B and C at 50 power for 10 seconds then brakes

