

GOAL: In ten lessons, 90 minutes each, students will gain an understanding of:

- What a robot is.
- Origin of the word Robot.
- How to move the robot (Mimic's) arm.
- What programming is.
- How a robot (Mimic) is programmed.
- Cooperation in a group problem solving situation.
- Robots in history.
- Jobs robots do.

SUPPLEMENTARY LEARNING:

- Literature
- History
- Digital control systems
- Reactionary forces
- Electric/kinetic/potential energy conversion

OHIO LEARNING STANDARDS: STRANDS (subjects) ADDRESSED:

- Technology
- Science
- Language Arts
- Math

LESSON ONE, CHAPTER ONE

Objectives:

- Introduce the robot mimicArm to the students.
- Develop an understanding of what a robot is and what it can do.
- Give students an opportunity to operate mimicArm

- Introduce vocabulary: robot, digital control, reaction force, energy conversion
- Introduce technology words program, code, servo, motor, sensor, control system, microcontroller, integrated circuit, circuitboard

Definition of a robot: A machine, usually computer controlled, that performs a task automatically with the ability to adjust to its environment.

OVERVIEW:

Provide a warm-up activity to introduce the topic of robots. Discuss a robot as a machine that does a job automatically. Discuss what is and is not a robot, as well as machines that are robots in some instances. Reveal the robot to the students and demonstrate what it can do. Introduce and demonstrate the words and concepts of robot, control and controller, control system, and computer words. Give the students an opportunity to move the robot arm. Review what was learned and end and discuss robots students encounter in daily life.

MATERIALS:

- mimicArm
- Robots in Fiction. (see bibliography)
- Pictures of historical robots
- Small items for the robot arm to grasp.

TIMELINE:

00:00-00:10

Greet students.

Discuss the word robot

Origin: Play R.U.R. by Karel Čapek

Definition of a robot: A machine, usually computer controlled, that performs a task automatically and adjusts to its environment.

00:10-00:20

Class discussion:

Discuss machines that are or are not robots

Robots:

Manufacturing Robot Arms

Roomba Vacuum

Washing machine

3d printer

Drone

Not robots:

Microwave (no physical work)

TV/DVR (no physical work, not automatic)

Computer (no physical work)

RC car (not automatic)

Sometimes a robot

Car (cruise control/autopilot)

Airplane (autopilot)

Robot arm reveal and class discussion: Is this a robot?

In manual mode mimicArm is not a robot. It is a robot when programmed to perform a task.

What makes it a robot?

What can this robot do?

00:20-00:30

Demonstration:

Demonstrate for the students how the robot moves.

Load the block sorting example. Show students how the robot can automatically sort blocks by color.

Discuss robot force feedback, demonstrate with light and heavy blocks.

Describe how force can be useful in programming a robot for various tasks.

Have students bring you items from around the classroom for the robot to grasp and lift.

00:30-01:00

Give each student a brief opportunity to use the robot.

Have the waiting students make suggestions about what each student should make the robot do.

Wave. Point. Make a circle in the air. Move it left.

Stack light blocks.

Stack heavy blocks.

Is there a weight limit on gripping/lifting?

Ask the students, "What do you think makes it work?" "How could a robot arm like this help you?"

Record their answers on a chart. There are no wrong answers at this point.

Advanced students:

Discuss the control system, which resides in the microcontroller on the circuit board.

Use the provided poster to help students understand the function of various microcircuits.

01:00-01:20

History of robotics.

Discuss the first robots:

Proto-robots:

Archytas designed mechanical bird, 4th century

Early automatons:

De Vinci 1495 mechanical knight (drawing only)

Friedrich Kaufmann mechanical soldier, 1810

Electronically controlled robots:

William Walter Autonomous Robot 1948

01:20-01:30

End with discussion of how fictional technology has changed modern life. Discuss how a centuries old concept was only effectively realized in the last half century.

Bibliography:

“R.U.R”, Wikipedia, <https://en.wikipedia.org/wiki/R.U.R>.

“The steam-powered pigeon of Archytas – the flying machine of antiquity”, <http://www.ancient-origins.net/ancient-technology/steam-powered-pigeon-archytas-flying-machine-antiquity-002179>

“Leonardo’s Lost Robot Knight – San Diego Museum Exhibit”, <https://davinCIAutomata.wordpress.com/2007/03/22/leonardos-lost-robot-knight-san-diego-museum-exhibit/>

“The Real DaVinci Code”, <https://www.wired.com/2004/11/davinci/>

“1810 – Automaton Trumpet Player – Friedrich Kaufmann (German)”, <http://cyberneticzoo.com/robots/1810-automaton-trumpet-player-friedrich-kaufmann-german/>

“The First Electronic Autonomous Robots: the Origin of Social Robotics”, <http://www.historyofinformation.com/expanded.php>