

DOODLING ROBOT

A. OVERVIEW

Subject	Physics
Age	6-10
Duration	60 minutes
Focus	Robots are machines that are designed to perform one or more tasks repeatedly and quickly. They are used in everyday life to make our lives more convenient.
Goals	Students will learn: 1. What is a robot. 2. How robots are used in society.
Objectives	After completing this section, students will understand more about robots and how they can perform different tasks in different settings.
Materials	Doodling robot kit and lesson plan 1 X AA, 1.5 volt battery Small cross-head screwdriver Large sheets of paper
Introduction	Background reading – robots Class discussion: different uses of robots and their advantages and disadvantages
Practical	Students will assemble doodling robots
Extensions	Investigation and discussion points

B. BACKGROUND READING

Set the background reading as a homework assignment the day before the planned hovercraft lesson. This lesson will cover 'robots' and provide a springboard for discussion on the working of a robot.

Review

Start the lesson by reviewing the reading.

Important points students should understand:

- Robots cannot think independently
- Robots can help make our lives more comfortable and convenient

Reading material

A robot is a machine designed to do one or more tasks repeatedly, with speed and precision. It gathers information about its environment and uses the information to follow instructions to do work. The term robot comes from a Czech word, *robota*, which means 'forced labor'.

A robot can be controlled by a human operator, sometimes from a great distance. However, most robots are usually controlled by computers. They can work as a stand-alone system, complete with their own computers. Or they can be part of a fleet of robots, ranging from a few to thousands, and all the robots in the fleet are under the control of a single computer.

Robots come in different sizes and shapes, and have various functions in industry. Some are used in factories and in our homes. Some are designed to perform surgery in hospitals, explore space, and do tasks that are too dangerous for humans to do. Some robots are called androids because they look like human beings. Androids usually move on wheels since robot legs are unstable.

Engineers are using artificial intelligence to make robots behave more and more like living creatures. Artificial intelligence is a branch of science that is concerned with the study and design of intelligent machines, especially intelligent computer programs. An intelligent machine is one that can store large amounts of information and process them accurately at high speed. It can also apply past experiences to new ones, compare them and come to logical conclusions, i.e. make intelligent decisions, just like humans. Take for example an electric iron. When it becomes too hot it understands that the temperature is more than what is required. It can react to that particular state, make a decision based on the situation and switch itself off. However, this function was not learnt through experience, so it cannot be truly classified as an intelligent machine. With the advances in technology, scientists are

creating new computer programs that try to recreate the process of human learning in a computer, in an attempt to make them think and copy the function of the brain.

C. CLASS DISCUSSION

Name one example of how robots are used in the following places

Place	Use of robot
Factory	In a car manufacturing factory, robots are used to assemble the different parts of the cars together.
Hospital	Robots can assist in surgery and allow doctors to perform operations remotely via a computer.
Police	Robots can help with the disposal of bombs or other dangerous materials.
Entertainment	Some robots that look, speak and move like humans are used in theme parks.
Home	Robot cleaners, such as vacuum cleaners, can be used in homes.
Research	Robots are used to explore space and areas which are dangerous for humans to go.

What are the advantages and disadvantages of using robots?

Advantages	Disadvantages
They can work continuously without getting tired.	They may take away jobs from people.
They can be used to perform dangerous jobs.	They might develop intelligence and abilities that are superior to those of humans, and disobey human commands.
They can work faster and more accurately than humans.	There is the possibility of their computer programming going wrong, causing harm to people.
Many of them are automatic so they do not need human interference.	They need a supply of power.
They are flexible and can adapt to new working environments.	They cost money to make and maintain.

D. PRACTICAL

Each group of students requires 1 kit and 1 instruction sheet. Select the relevant information from the instructions if necessary. Go through the safety warnings given in the instructions with the class before assembly.

Check each group's finished model and supervise the test runs.

E. EXTENSIONS

- How does changing the orientations of the arms in your doodling robot affect the patterns being drawn?
- Why must the pens vibrate up and down in order to draw pictures?
- Vibration refers to oscillatory motion: movement in one direction and then back again in the opposite direction. Can you think of examples of vibration in everyday life?
- Find out about other machines that use vibrations in their operations.

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