

ACTIVITY 5.3 ROBOTS IN SPACE

From Chapter 5 of the Principia Space Diary

<http://principiaspacediary.org/activities/robots-in-space>

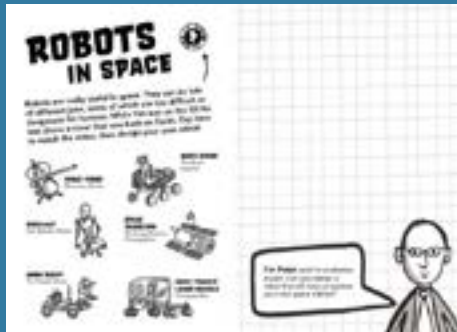
LEARNING LEVEL

KS1, KS2, P1-5

CURRICULUM LINKS & DIFFERENTIATION IDEAS

View detailed curriculum links for England, Scotland, Northern Ireland and Wales, plus differentiation ideas for your region and year level.

principiaspacediary.org/curriculum-planner/



Resources Required

- Computers with internet access
- D&T and electrical equipment (optional)

Background to this Activity

Robots are really useful in space. They can do lot of different jobs, some of which are too difficult or dangerous for humans. Here are some examples:

Robonaut is a robot that will one day be used for spacewalks or extravehicular activities. The robonaut has a humanoid shape and is controlled by a human operator with a computer. Robonaut 2 – or R2 – flew to the ISS in 2011. R2 has hands and fingers like a human, and can perform tasks which involve a high level of dexterity. Engineers and scientists are now developing legs for R2, so that it can perform tasks inside and outside the ISS.

Robotic Arms are used to help handle cargo and inspect the ISS and spacecraft for damage. The current robotic arm on the ISS is called the Canadarm 2. It is 17.6 metres long and weighs 1800kg. It can lift up to 116,000kg! It is a clever system which can relocate itself and move like an inchworm to reach different parts of the ISS.

Space probes are spacecraft that can explore other planets, asteroids or comets without the need for astronauts. Controlled by humans on Earth, they provide information about temperatures, radiation, magnetic fields, what a planet's atmosphere is made of, soil composition and the presence of water.

Space telescopes, like the Hubble Space Telescope <http://hubblesite.org>, have provided breathtaking images of the solar system. The Hubble Telescope will be replaced by the James Webb Space Telescope <http://www.jwst.nasa.gov> in 2018. These telescopes have helped us find out about the birth and death of stars, and the existence of exoplanets.

Moon buggies are also known as Lunar Roving Vehicles (LRVs) and were used in 1971 and 1972 to extend the

distance that astronauts could explore on the Moon, during the Apollo missions.

Mars Rovers have been used to explore and map the red planet. National Geographic have produced a clip of what the rovers might look like as they explore the Martian landscape: <http://video.nationalgeographic.com/video/mars-rovers-sci>.

Running the Activity

This activity is about how useful robots can be in space exploration. Students can investigate the way robots are used in space by reading the background notes. Alternatively, they can research robots in space for themselves before they begin the designing process. Can you design a robot that will help us explore your new space habitat? Think about what the purpose of the robot will be, then add those features. Make sure you clearly label your design.

Students can further investigate the use of robots in space with:

- ESA information about the ISS robotic arm: http://www.esa.int/Our_Activities/Human_Spaceflight/International_Space_Station/European_Robotic_Arm
- Information about the exploration of Mars: <http://exploration.esa.int/mars/>
- Play the Science Museum's Rugged Rovers app available for iPhone, iPad and Android. http://www.sciencemuseum.org.uk/online_science/apps/rugged-rovers

Extensions & Digital Resources

ZAP! Students can use the Zappar app to watch a video of Tim Peake controlling a rover while he was on board the ISS. See Zappar instructions at the link below and note that the mobile/tablet will need to be connected to the internet: <http://principiaspacediary.org/using-zap-codes-to-strengthen-digital-literacy/>

ACTIVITY 5.3 (CONT.) ROBOTS IN SPACE

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Questions for the Class

- Why are robots useful in space exploration? What can they do that a human could not?
- What might be some of the problems in using robots to explore, rather than people?
- Should robots or humans explore other planets?
- What would you let a robotic companion do for you? What wouldn't you let it do for you?
- What is your favourite type of space robot? Why?
- Why would you want to send a robotic probe to the distant planets, rather than humans?



NASA astronaut Shane Kimbrough and ESA astronaut Thomas Pesquet captured and berthed Japan's HTV-6 supply craft on 14 December 2016 using the International Space Station's 17 m-long Canadarm2 robotic arm.

Photo credit: ESA/NASA