Science Screen Report FOR KIDS

VOLUME 24, EPISODE 3 - 10 minutes

ROBOTICS: *Challenges for the Future*

SYNOPSIS

Robots are being introduced into our society to help in a variety of ways. They help on assembly lines, in agriculture, assisting doctors in complicated surgeries, and exploring space and other planets.

This edition of Science Screen Report investigates the roles of robots in our society and how they might help in the future. The focus is the Defense Advanced Research Projects Agency, or DARPA. DARPA's robots are involved in the fields of biology, medicine, computer science, chemistry, physics, engineering, mathematics, material sciences, social sciences, neurosciences and more. DARPA has set prize competitions to spur the development of technologies focused on autonomous emergency-maintenance robots.

CURRICULUM UNITS

- ENGINEERING
- ROBOTICS

CAREER POSSIBILITIES

- INDUSTRIAL ENGINEER
- MECHANICAL ENGINEER
- ROBOT TECHNICIAN
- SOFTWARE ENGINEER

NEXT GENERATION SCIENCE STANDARDS & NATIONAL SCIENCE EDUCATION STANDARDS

NEXT GENERATION SCIENCE STANDARDS: www.nextgenscience.org

MS. Engineering Design

ETS1.A: Defining and Delimiting Engineering Problems

The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions.

ETS1.B: Developing Possible Solutions

A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.

There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.

Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.

Grades K - 4

Science & Technology

Abilites of Technological design

Understandings about science and technology

Grades 5 - 8

History and Nature of Science

Nature of science

History of science

CRITICAL THINKING EXERCISES

1. Ask students how they think robots affect their lives. Have students discuss ways that robots may affect their lives in the future.
2. Discuss with students how robots can assist in disaster relief and recovery operations. How will robots in these scenarios help to protect people?
3. If students had the opportunity to design their own robot, what purpose would it serve?
4. Ask students to consider a job that a family member regularly does and to consider how a future robot might be able to assist in completing the job. Have them draw a labeled sketch of their proposed robot.

ABET
Accreditation Board for Engineering and Technology
www.abet.org

NMOE
National Museum of Education
www.nmoe.org

BACKGROUND

Robots will have major economic impacts on society in the future. We will see robots excel as drones, in more medical procedures and health related services, in prosthetics, to assist people around the home, and autonomous vehicles.

Robots are doing human labor in all kinds of places, including the jobs that are unhealthy or impractical for people. This frees up workers to do the more skilled jobs, such as the programming, maintenance, and operation of robots.

To fulfill its mission, DARPA relies on engineers to apply multi-disciplinary approaches to advance knowledge through basic research and create innovative technologies that address current practical problems. DARPA's robots are involved in the fields of biology, medicine, computer science, chemistry, physics, engineering, mathematics, material sciences, social sciences, neurosciences and more. Our daily lives are regularly impacted by the science of robotics. As these technologies become more integrated into our daily lives, we may see many additional benefits.

ADVANCED ORGANIZERS

Prior to viewing this video, students should have some understanding of the following Benchmarks for Science Literacy, Oxford University Press, which are excerpted and, in some cases, abbreviated below. Refer to the Benchmarks for more information.

Benchmark 3. THE NATURE OF TECHNOLOGY

Section A: Technology and Science, Grades 3-5

- Technology extends the ability of people to change the world: to cut, shape, or put together materials; to move things from one place to another; and to reach farther with their hands, voices, senses, and minds. The changes may be for survival needs such as food, shelter, and defense; for communication and transportation; or to gain knowledge and express ideas.

Grades 6-8

- Technology is essential to science for such purposes as access to outer space and other remote locations, sample collection and treatment, measurement, data collection and storage, computation, and communication of information.

Section C: Issues in Technology, Grades 6-8

- Technology is largely responsible for the great revolutions in agriculture, manufacturing, sanitation and medicine, warfare, transportation, information processing, and communications that have radically changed how people live and work.

**Benchmarks can be found at www.project2061.org/tools/benchol/bolintro.htm*

VOCABULARY

Autonomy (Autonomous Vehicle): An autonomous car, also known as a driverless car, driver-free car, self-driving car or robot car, is a vehicle that does not require a driver. It is capable of fulfilling the human transportation capabilities of a traditional car.

DARPA: An organization created in 1958 by President Dwight D. Eisenhower for the purpose of forming and executing research and development projects to expand the frontiers of technology and science to reach far beyond immediate military requirements.

Dexterity: Skill or adroitness in using the hands or body; agility.

Global Positioning System (GPS): A system of satellites combined with receivers on the Earth that determines the latitude and longitude of a particular receiver through triangulation. The distance of the receiver to three of the satellites is ascertained by measuring the time-delay of a predetermined radio signal.

Locomotion: The act or power of moving from place to place.

Mobility: The ability to move physically.

SUGGESTED REFERENCES

- *The Honda Humanoid Robot Asimo:* http://world.honda.com/ASIMO/ *and* http://asimo.honda.com/EducationMaterials.aspx
- *The Defense Advanced Research Projects Agency, or DARPA:* www.Darpa.mil
- *The DARPA Robotics Challenge:* http://www.theroboticschallenge.org/
- *iRobot homepage:* www.irobot.com