



LIVE INTERACTIVE LEARNING @ YOUR DESKTOP

Algebraic Equations: Calculator Controlled Robots

Presented by: Jordan Snyder

November 7, 2012

6:30 p.m. – 8:00 p.m. Eastern time



Introducing today's presenter...

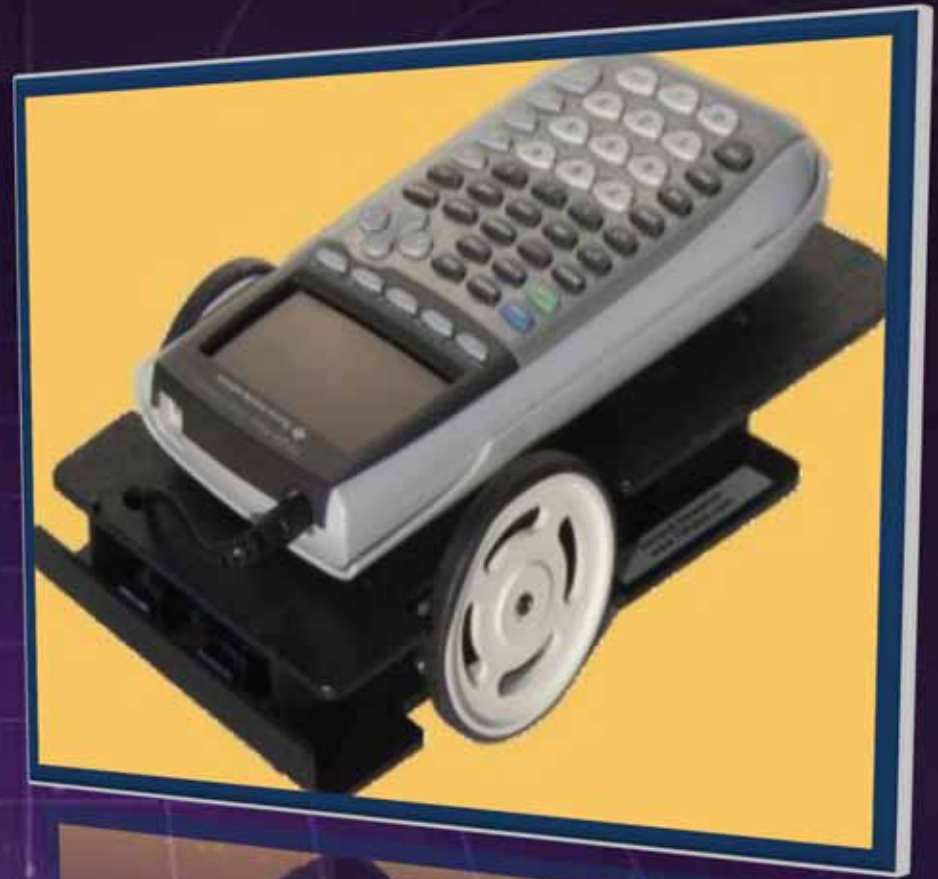
Jordan Snyder

NASA Explorer Schools Education Specialist
NASA Goddard Space Flight Center
Greenbelt, MD



NASA Explorer Schools
Algebraic Equations

**Calculator
Controlled
Robots**



Presented by Jordan Snyder



Agenda

- **Robots**
- **Robots at NASA**
- **Activity information**
- **Missions in detail**
- **Basic commands**
- **Extensions/links**
- **NASA Explorer Schools**





What is a robot?



What is a robot?

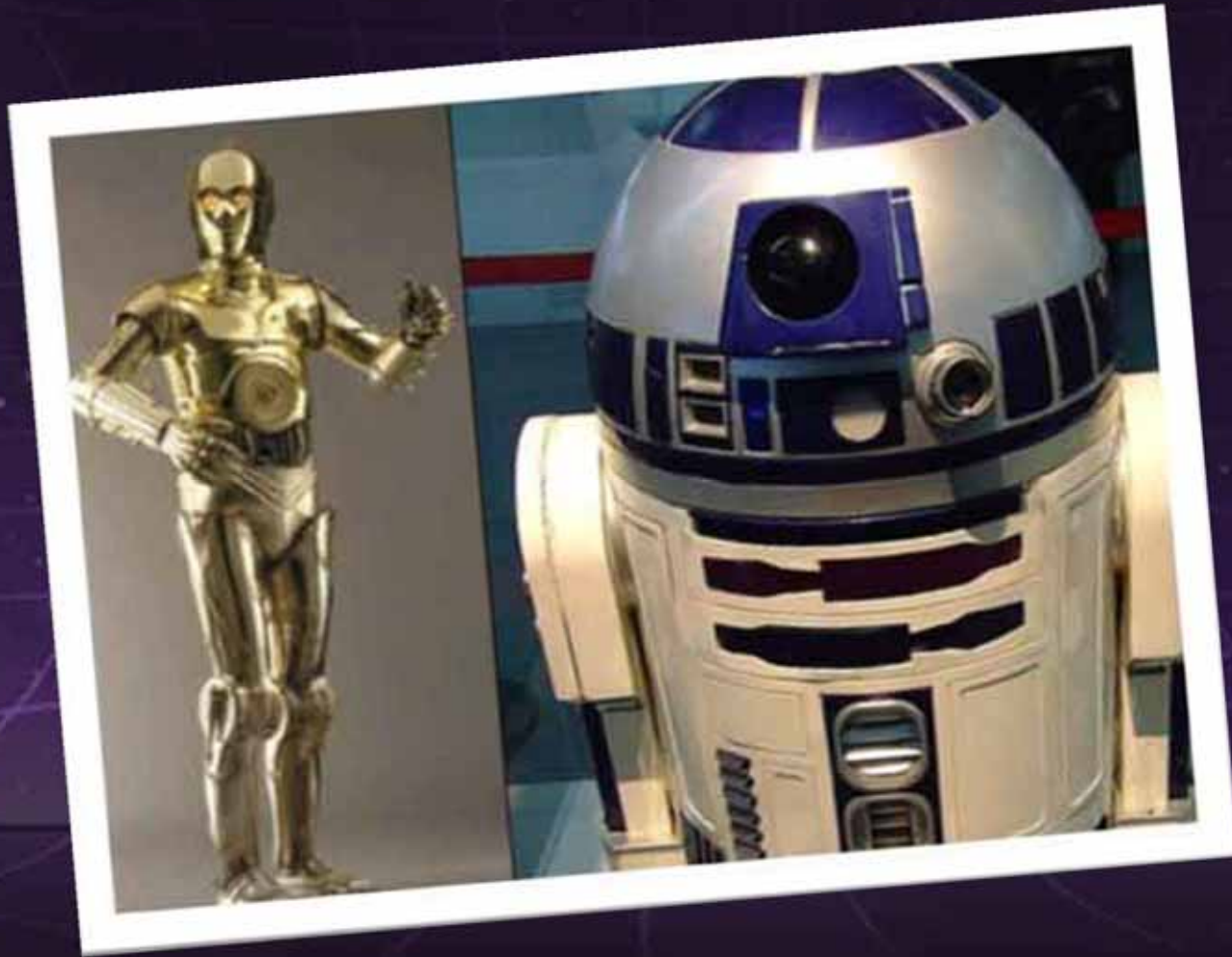
- **A machine**
- **Acts automatically**
- **Senses the world**
- **Processes information**
- **Responds to information**

How Do Robots Gather Information?

- Cameras
- GPS
- Laser rangefinders
- Light sensors
- Temperature sensors
- Touch sensors



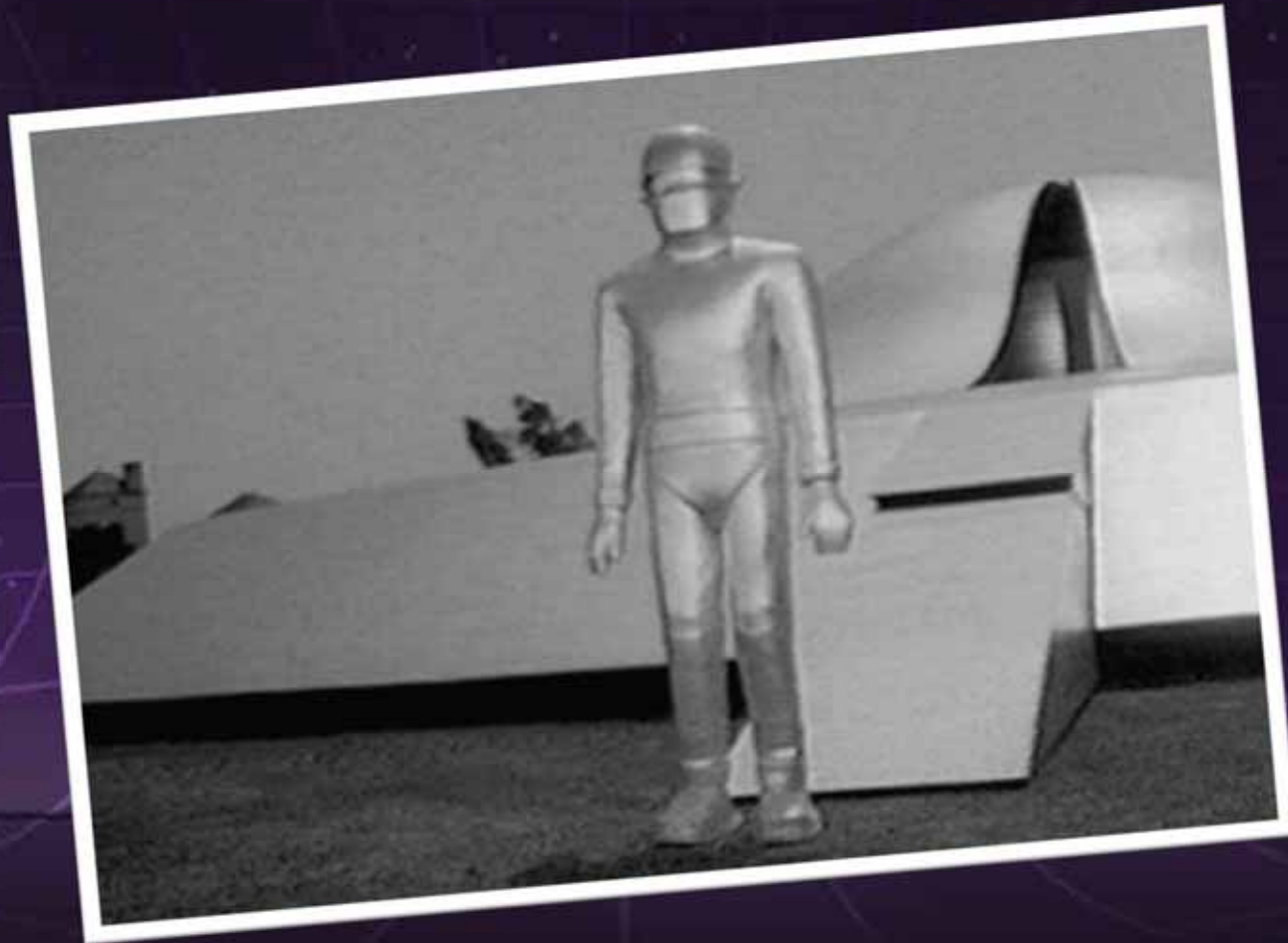
Robots From the Movies



Robots From the Movies



Robots From the Movies



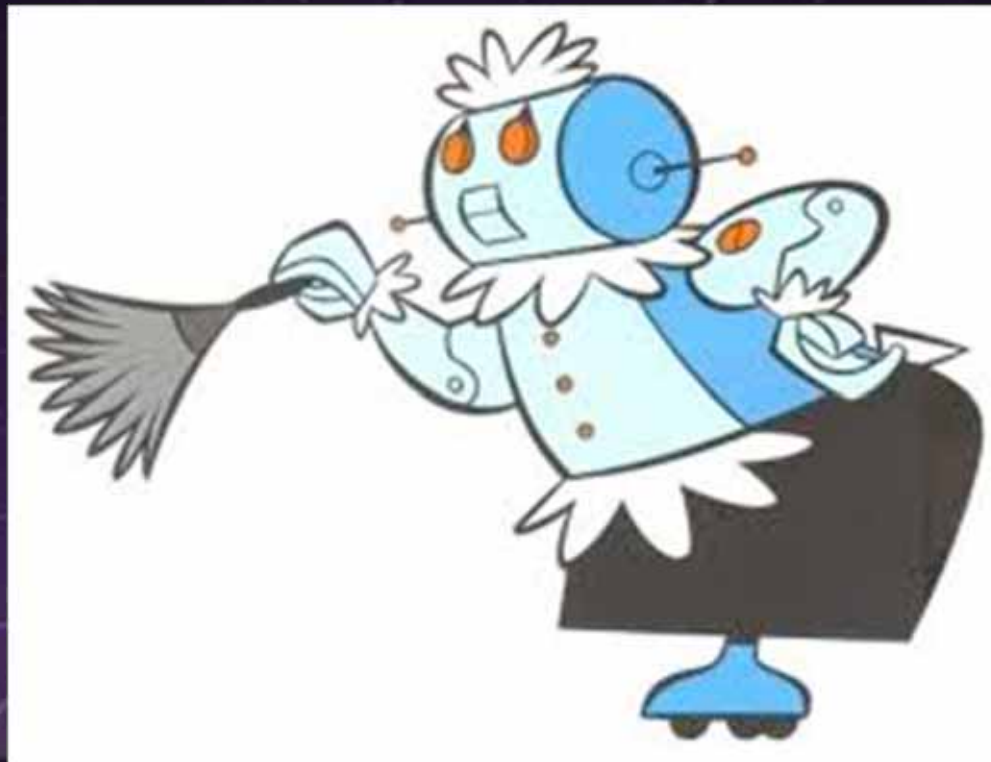
Robots From the Movies



Robots From the Movies



Robots From the Movies



Robots From the Movies





Robots in the Home

- Roomba
- Litter Robot
- Aibo
- Lawnbot
- Hexbug





NASA Robots





Curiosity





Mars Rovers



Spirit/Opportunity
2004

Sojourner
1997

Curiosity
2011

NASA Now – Mars Month





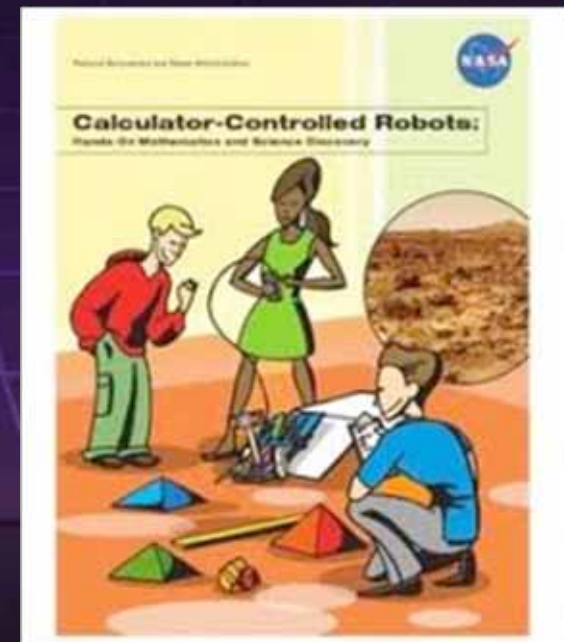
Questions?





Calculator Controlled Robots

- Ten missions
- Three extension missions
- Hands on
- Sequential
- Math application





Subject Area

- Math and technology
- Grade Levels: 6th – 8th





What Do They Learn?

- Learn to program robots
- Use technology to solve problems
- Apply math concepts
- Work as a team





Materials

- Calculator
- Robot kit
- <http://www.smallrobot.com/scimath.html>
- Educator Guide





Preparation

- Download the guide:
www.nasa.gov/pdf/239512main_Calculator_Contr
[olled_Robots.pdf](http://www.nasa.gov/pdf/239512main_Calculator_Contr)
- Read the guide
- Program your robot





Common Core Standards

- Calculator
- Robot kit
- <http://www.smallrobot.com/scimath.html>





Questions?





Calculator Controlled Robots

Grade Level 6 - 8





Primary Materials

- **Norland calculator robot**
- **Graphing calculator**
- **Meter stick**
- **Graph paper**
- **Safety goggles**



Robot





Touch Sensor

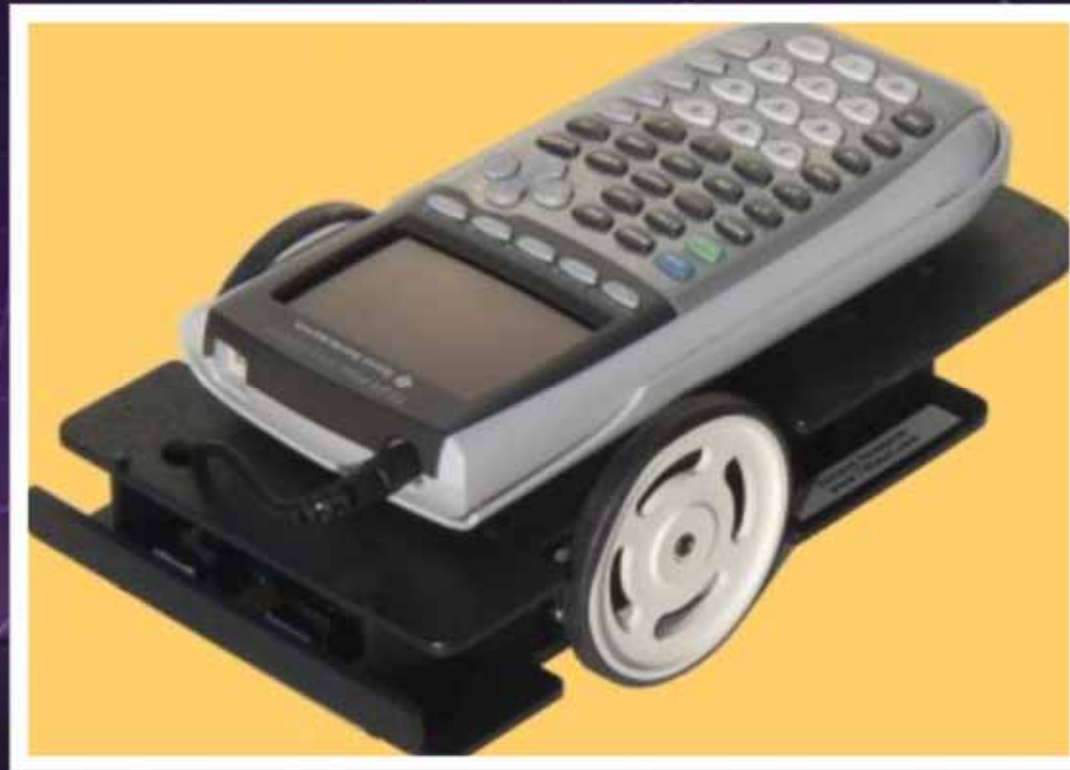


Touch Sensor





Programming Instructions





Questions?





Introduction





Engagement!





Mission 1 - Measure

- Determine speed
- Determine duration
- Calculate distance
- Extension

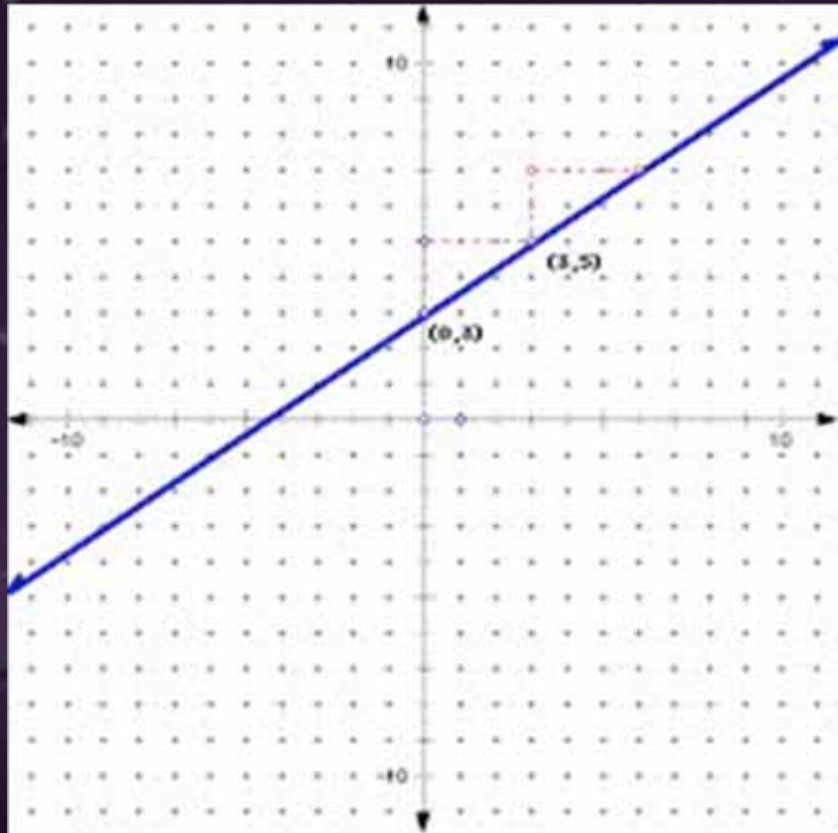


Mission 2 – Graph and Predict

- **Make table**
- **Graph linear function**
- **Predict**
- **Extension**



Mission 2 – Graph and Predict



Mission 3 – Turns and Mazes

- Turns and basic commands
- Pythagorean Theorem
- Rocket math





Mission 4 – Circles

- **Geometry Challenge**
- **Discover Pi**
- **Circumference**





Mission 5 – Game Spinner

- **Probability**
- **Integers**
- **Finding unknowns**





Mission 6 – Game Day

- Fun applications
- Experimentation





Mission 7 – $E=MC^2$

- Standard notation
- Scientific notation
- Exponents
- Formulae





Mission 8 – Cool Stuff

- **Graph Functions**
 - Linear
 - Quadratic
 - Absolute value
 - Radical
- **Create solution table**



Mission 9 – Mission to Mars

- Preprogramming
- Samples
- Curiosity connection





Mission 10 – Popbots

- **Final assessment**
- **10 problems to solve**





Questions?





Basic Programming

<http://mste.illinois.edu/resources/ti/robot/docs/DrivingTIRobot.pdf>



Meaning of Numbers in Command

Command = 123

- 1= Move for a certain amount of time
- 2= Move until the front bumper hits something
- 3= Move for a certain time unless the front bumper hits something first



Meaning of Numbers in Command

Command = 123

- 0 = Rotate backward
- 1 = No motion
- 2 = Rotate forward



Meaning of Numbers in Command

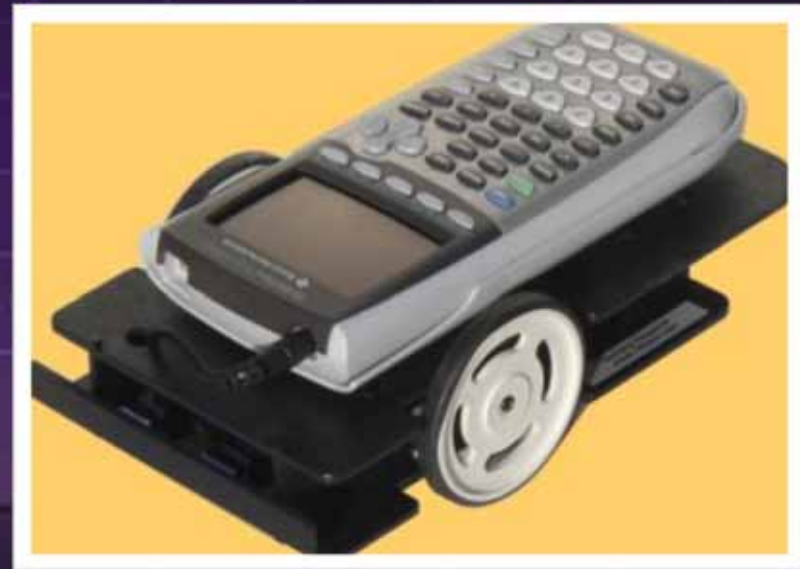
Command = 1[↑]23

- 0 = Rotate backward
- 1 = No Motion
- 2 = Rotate forward



What will the robot do?

- Send ({100})
- Send ({222})
- Send ({102})
- Send ({221})





Questions?



Where is everything?

TI Robot Application

- <http://mste.illinois.edu/resources/ti/robot/about/index.html>

Educator Guide

- [http://www.nasa.gov/pdf/239512main Calculator Controlled Robots.pdf](http://www.nasa.gov/pdf/239512main_Calculator_Controlled_Robots.pdf)

TI Connect Software

- [http://education.ti.com/educationportal/sites/US/productDetail/us ti connect.html](http://education.ti.com/educationportal/sites/US/productDetail/us_ti_connect.html)

Robot Kits

- <http://www.smallrobot.com/scimath.html>



Extensions and Resources

Calculator Controlled Robots



Preloaded Programs

- DEMO
- EXPLORE2
- GAME1
- MACER





DEMO Program

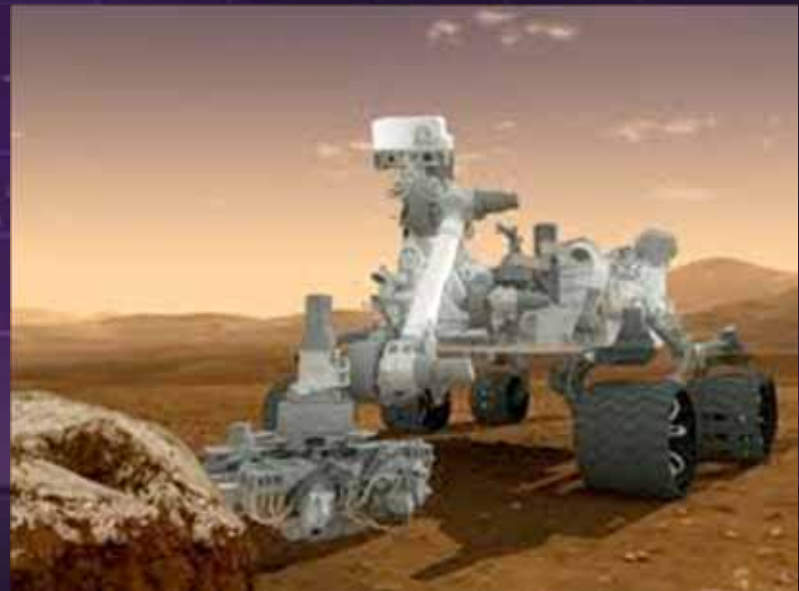
- Demonstrates basic capabilities of the CCR
 - Forward
 - Backward
 - Circular motions
 - Bumper switch responses





EXPLORE2 Program

- Missions 9 & 10
- Remote control





GAME1 Program





MACER Program

- Race
- Math practice





Mars for Kids Web Tour

<http://marsprogram.jpl.nasa.gov/participate/funzone/>



WHY NES?

easy



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=

NASA ACCESS



 **NASA Explorer Schools
VIP Access**



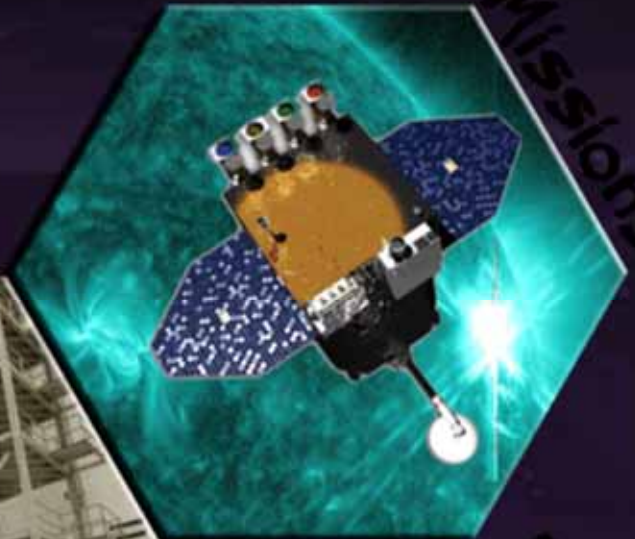
**ED U.
CATOR**

00001 **TEACHER**



<http://explorerschools.nasa.gov>

Facilities



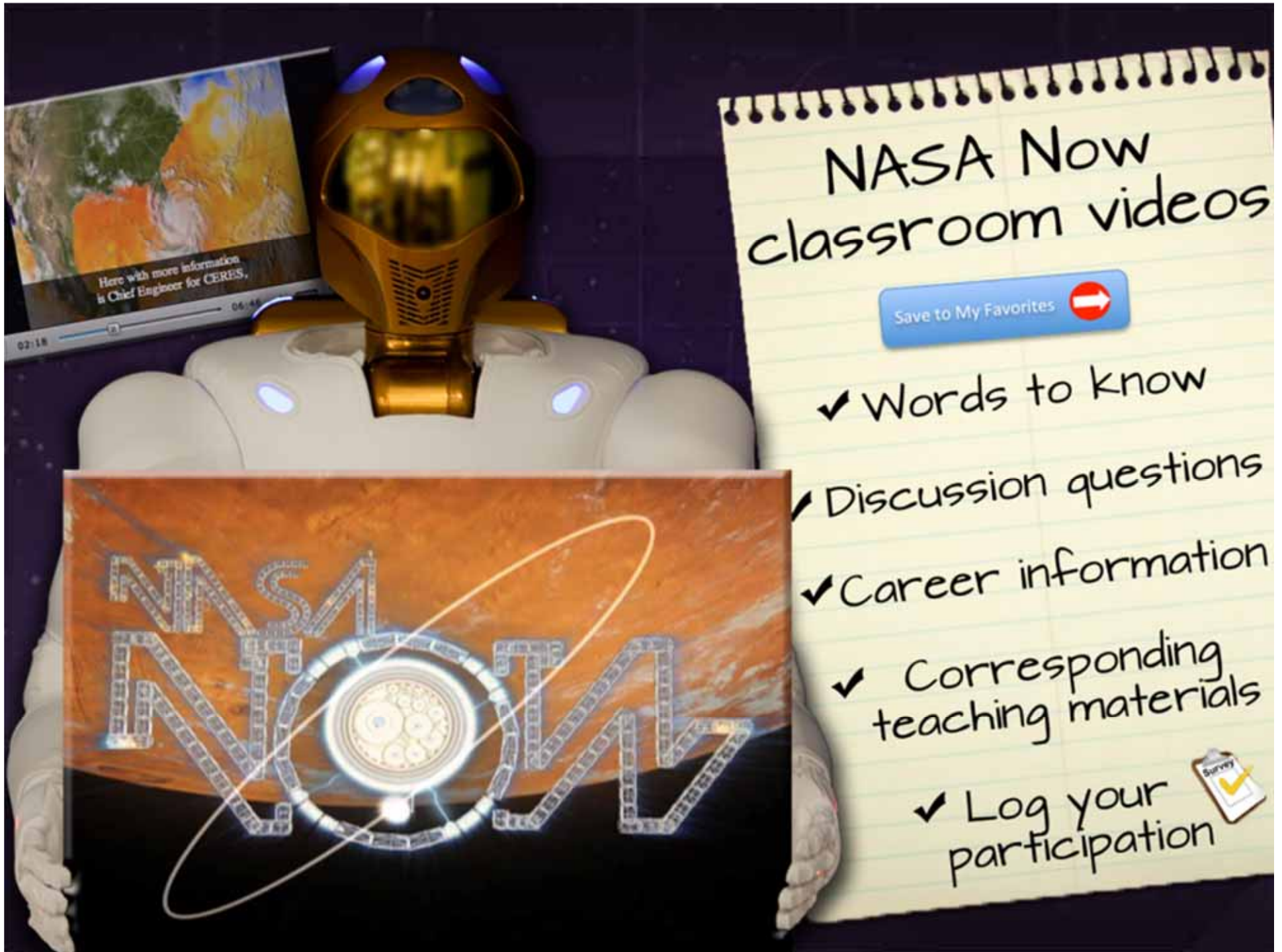
Missions




People


Research





NASA Now classroom videos

Save to My Favorites 

- ✓ Words to know
- ✓ Discussion questions
- ✓ Career information
- ✓ Corresponding teaching materials
- ✓ Log your participation 

Live video chat



explorerschools.nasa.gov



Spacewalk Resources

- Spacewalks and Spacewalks
- Interactive Spacewalk Experience
- The NASA Spacewalk

Working in Microgravity Resources

- Station Spacewalk Game



Chat Transcript

Hello and welcome! The NEES chat with astronaut and former spacewalker Mike Foreman is now open. Foreman will answer questions about his spacewalking experiences, living and working in the microgravity environment of space, and his unique career path from high school through astronaut training. Questions asked during the live event will be answered on-air as time allows.

MI_Jefferson (Q) What is the most challenging part of a spacewalk?
Mike-Foreman (A) Probably the training for the spacewalk is the most difficult because it requires many hours working out in the big pool in Houston.

MI_Jefferson (Q) What were you trying to accomplish through your spacewalk?
Mike-Foreman (A) Each of my five spacewalks had different goals, some spacewalks were to construct the International Space Station, some were to add additional parts on the outside of the space station like antennas.

MI_Jefferson (Q) Did you see the city you grew up in from space?
Mike-Foreman (A) I did see my hometown Wadsworth, OH at nighttime on my first mission. I could see the lights of my hometown that is close proximity to Cleveland and Akron.





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Bringing NASA to your classroom

The screen displays the NASA Explorer Schools website with the following sections:

- Virtual Campus**
 - Virtual Campus Home
 - My Activities Portfolio
 - Search NES Classroom Resources
 - Calendar of Events & Seminars
 - Strategies for Success
 - Recognition Opportunities
 - Help and Contact Information
 - Sign Out
- Ask an Expert**
 - CHAT
 - NASA Explorer Schools invites teachers and their students to chat with a NASA expert and have their questions answered during a live video chat.
 - NES video chats
- Collaborate With NES**
 - Get the latest project updates, alerts and information about upcoming NASA events and NES opportunities.
 - Like us on Facebook
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 - Subscribe to our NES Teachers Corner Blog
- Items You Don't Want to Miss**
 - NASA Explorer Schools
 - YouTube
- Latest NASA Now Video**
 - Robotics: Curiosity -- Life to Landing
 - Nagin Cox talks about the challenges scientists, engineers and technicians faced to build NASA's rovers Curiosity and land it successfully on Mars.
 - Search NES Classroom Resources for More NASA Now Classroom Videos?
 - What is a NASA Now Classroom Video?
- Featured Lessons: Mars**
 - Grades 4-8 Properties of Living Things: Searching for Life on Mars
 - Grades 8-10 Electromagnetic Spectrum: Remote Sensing of Ice on Mars



Thanks to today's presenter!

Jordan Snyder

NASA Explorer Schools Education Specialist
NASA Goddard Space Flight Center
Greenbelt, MD





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