

Martian Rover

Henry Wilson Memorial

click below to view the movie

10 Mars Rover Project

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Project Recap

The idea for the project came from an activity in an older science textbook. This activity used a radio controlled car to negotiate an obstacle course. The catch was the driver of the vehicle could not see the course and had to take directions from a partner. Having gone to workshops on robotics and ordering weather instruments for class work, I clearly saw the possibility of combing several things here into a major project.

Thus began my downfall. MAJOR Project was an understatement. I did have several resources that I contacted and all thought that it could be accomplished somehow. A friend from a local vocational center gave a few good pieces of advice and put me in contact with some individual to continue the project with. A couple visits to hobby stores enlightened me on the types of vehicle available and their capabilities. Several programs are available that allow an actual transmitter to be used in flight simulation on a computer. So far though nobody has then linked it to a remote vehicle. Further research on the web showed the military using a very similar vehicle to detect bombs in alleys and buildings. Several conversations with people who are involved with robotics offered suggestions. I emailed several individuals from radio control clubs who also gave encouragement.

The biggest roadblocks were from those I had to work with in the district. Even after explaining what I needed and how I actually had to have materials to figure out what problems would arise, they were reluctant to give me the go ahead. Most purchases were made on my credit card and then reimbursed. The tech staff seemed to have greater “priorities” in the district and often I was left to fend for myself.

As I persevered though, I kept getting more and more psyched. A visit to a hobby store led to the purchase of the two vehicles to be modified. Unfortunately, he only had one set of batteries and no chargers. An online search and I ordered the parts only to find the charger was meant for a different type of battery and the two new batteries had different plug connectors. Returns and adapters finally put things right. As the parts arrived the students began to get fired up as well. Volunteers were recruited for assembly and test drives. Computer knowledgeable students helped with the loading of the programs and checking the range of the equipment. Problem solving skills were put to the test in many areas from as simple as: “Are the batteries in there right? We need a stronger support here. We need to balance the load better. How do we log the weather data? Can we slow these things down? How does the linkage from the servos hook to the transmitter?” just to mention a few.

Planet Comparison

Planet (solid only)	Surface Features	Distance From Earth	Atmospheric conditions	Date when closest to earth

Systems finally got up and running and we were able to make the first functional run. This was done from the classroom and manually controlled and the first pictures and information from the “other planet” were transmitted. Unfortunately one of the cameras died and needs replacement. The next step is to get the two operating with the same room. The transmitter controls are on different frequencies but the weather stations are not so data won't be exchanged. Hopefully we will be able to have one unit at the high school about ¼ mile away by the end of this year.

This was something I was interested in trying for several years and it turned out to be all that I hoped it would be although a little advanced for most 8th graders. I also had another project rolling with PSNH and a Saving Through Energy Management training. Doubling up on these is not recommended. There is more to this grant that needs work. I still intend to go the full program of shipping one unit to another state or country. Perhaps we could even set up a network across the states and share a variety of data.

After viewing the movie *Roving Mars* the students had a good appreciation of what it took to actually get something that complication to another planet AND HAVE IT WORK!

The true success for this could be a couple years away as I keep thinking of more that I could incorporate into the project. Investigation of a parachute landing system has some students interested as well as more research on mars itself. Some are trying to find out what it will take for humans to exist on mars for an extended period of time and designing a facility to meet all the needs including entertainment and leisure activity as well as the scientific aspect.

A major jump in computer literacy occurred with the making and the editing of the video. I've tried a couple of podcasts and power points but this sort of combined both to make it work. I found that 2 ½ minutes is a lot shorter than I realized but I think I documented most of what happened. I need a little more practice to refine a few transitions and double tracking music with talking. Time was my limiting factor. I can see a simpler project could have increased some of these skills without the complexity of the rover itself.

I would recommend others trying for the grant as the whole process is a good learning experience. It provided both rewarding and challenging moments.

Earth science
Astronomy

Mars Rover Unit

Essential Questions:

1. How do astronomers gather information utilizing remote sensing devices on other planets?
2. What sort of information can we get from other planets via remote sensors?
3. Which planets are most suitable for a probe to be landed on?
4. What set of systems are needed for a successful mission?

Standards

S:ESS4:8:1.1 Describe ways in which technology has increased our understanding of the world in which we live.

S:ESS2:8:3.4 Compare and contrast planets based on data provided about size, composition, location, orbital movement, atmosphere, or surface features (includes moons). [ESS2(5-8)MAS-6

S:ESS2:8:4.1 Explain how technological advances have allowed scientists to re-evaluate or extend existing ideas about the Solar System. [ESS2(5-8)NOS-7

S:ESS4:8:1.2 Recognize the importance of technology as it relates to science, for purposes such as: access to space and other remote locations, sample collection and treatment, measurement, data collection, and storage, computation, and communication of information

S:ESS4:8:1.1 Describe ways in which technology has increased our understanding of the world in which we live

S:ESS4:8:2.1 Calculate temperature in degrees Celsius

S:ESS4:8:2.3 Describe how man uses land-based light telescopes, radio telescopes, satellites, manned exploration, probes and robots to collect data

S:ESS4:8:4.1 Understand that some scientific jobs/careers involve the application of Earth Space science content knowledge and experience in specific ways that meet the goals of the job

S:SPS1:8:1.1 Use appropriate tools to accurately collect and record both qualitative and quantitative data gathered through observations (e.g., temperature probes, electronic balances, spring scales, microscopes, stop watches

S:SPS3:8:1.1 Work effectively within a cooperative group setting, accepting and executing assigned roles and responsibilities

S:SPS3:8:1.2 Work collectively within a group toward a common goal

S:SPS3:8:1.3 Demonstrate respect of one another's abilities and contributions to the group

		10 Martian Rover Weather data						
date	time	temp curr.	temp. min	temp. max	humidity	UV reading	wind spd	wind dir.

S:SPS3:8:2.1 Locate and collect reliable information about the environment and environmental topics using a variety of methods and sources

S:SPS3:8:3.3 Evaluate student-designed products according to established criteria and recommend improvements or modifications

S:SPS4:8:1.1 Use a variety of information access tools to locate, gather, and organize potential sources of scientific information to answer questions.

S:SPS4:8:1.2 Collect real-time observations and data, synthesizing and building upon existing information (e.g., online databases, NOAA, EPA, USGS) to solve problems.

S:SPS4:8:1.3 Use appropriate tools to analyze and synthesize information (e.g., diagrams, flow charts, frequency tables, bar graphs, line graphs, stem-and-leaf plots) to draw conclusions and implications based on investigations of an issue or question

S:SPS4:8:2.1 Use a wide range of tools and a variety of oral, written, and graphic formats to share information and results from observations and investigations

S:SPS4:8:6.2 Plan and develop team science projects

S:SPS4:8:9.1 Collaborate with a network of learners by phone, video, virtual classroom platform

Materials:

Text materials on planets

Computers for research and rover operations. Interfaces and web cams needed for information gathering, robotic control, and video conferencing with second command post.

Two R/C controlled vehicles large enough to hold the sensing units and wireless camera.

Two wireless weather stations to include: humidity, temperature, wind speed and direction, and UV rating.

LEGO mindstorm programmable blocks. 2 sets of servos to provide mechanical linkage for control of the R/C transmitters.

Suitable terrain for vehicles

Associated software for data logging from sensors and access to remote camera.

Optional: flight simulator to give realism to landing a craft flying on instruments.

Research: Divide into teams to investigate the following:

Gather information on the planets of our solar system using books and internet. Formulate a table of comparison to determine the most appropriate “planet” to investigate. Factor should include surface type and terrain, temperatures, gravitational force, atmosphere, and orbital positions.

Investigate space probes and remote sensing devices and sketch out a potential design for the rover.

After selection of planet determine method of delivery of the probe to the planet’s surface. Options may be glide, (research devices), if there is an atmosphere or propulsion assisted if no atmosphere.

Show “Roving Mars” DVD and evaluate student designs and list and discuss potential problems.

Allow 2 days for research and one day to discuss issues.

Select two teams for construction of rovers. These may be several students from different classes. Due to the nature and cost of materials, skills in following directions, quality of work and problem solving abilities this needs to be a very select group. Close teacher supervision is needed so this team may need to work outside the regular class time.

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