NEW FRONTIERS OF THE TEACHING PROCESS

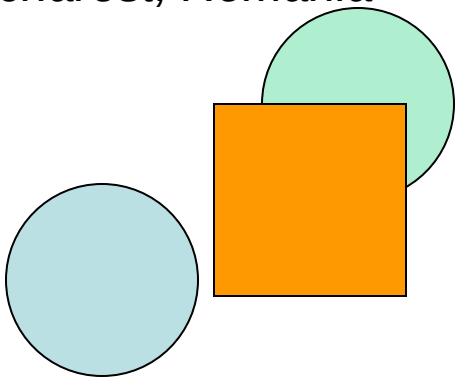
Author:

Ioana Stoica

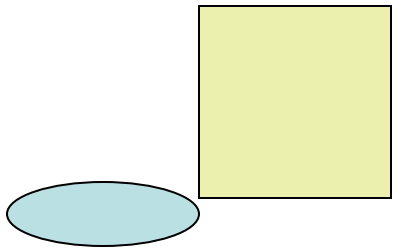
Physics Faculty, Bucharest University, P.O. Box MG-11, Bucharest-Magurele, Romania

Tudor Vianu National High School of Computer Science, Bucharest, Romania

e-mail: istoica4143@gmail.com



The main aim of the author is to describe an unconventional teaching way, an add-on for the classical teaching process: the school research projects. I will describe a project developed under NASA supervision: the Lunar Crater Observation and Sensing Satellite.



Motto:

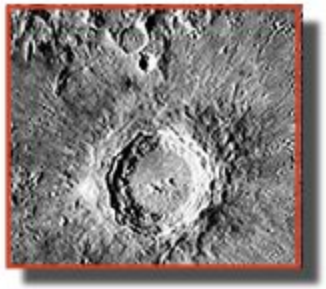
Explore and discover,
Learn and teach,
Build and share!
This must teachers, parents and NASA do!

- The main objectives of the NASA school project are:
- • Supporting students hands-on learning of science
- • Inspiring the next generation of engineers
- • Delivering hands-on activity resources to educators
- • Offering online training on the design process to educators
- • Learning in an opening way
- • Learning more about Astronomy and Physics in an unconventional way
- • Improving one's team work and the communication skill
- • Learning how to express one's opinion
- • Improving one's organizational skills
- • Improving English language abilities

- The pointing out of anchor-knowledge necessary in the teaching of new concepts, and the training of the students in conceptual and operational structures constructions
- The equal treatment of all the students, without any discrimination and prejudice, regarding their individual self-esteem and respect, their candid and systematic evaluation, their commitment toward the duties in the line of work, and so on
- The integration of the achieved knowledge and intellectual strategies into a derived general scientific frame.

The Mission Objectives of the Lunar Crater Observation and Sensing Satellite (LCROSS) include confirming the presence or absence of water ice in a permanently shadowed crater at the Moon's South Pole. The identification of water is very important to the future of human activities on the Moon. LCROSS will excavate the permanently dark floor of one of the Moon's polar craters with two heavy impactors in 2009 to test the theory that ancient ice lies buried there. The impact will eject material from the crater's surface to create a plume that specialized instruments will be able to analyze for the presence of water (ice and vapor), hydrocarbons and hydrated materials.

LCROSS will also provide technologies and modular, reconfigurable subsystems that can be used to support future mission architectures.



In Part I of this Challenge, students were tasked to chart a course from the Big Island of Hawai'i to Rapa Nui (Easter Island) using ocean navigation skills used in early Polynesian exploration. See http://quest.nasa.gov/challenges/lcross2/
Participation in Part I, while helpful, is not a requirement for Part II.

Now, in Part II of the Challenge, students will be tasked to chart a course from Kennedy Space Center at Cape Canaveral, Florida to one of the lunar poles using navigation skills appropriate for outer space. For this task, students will submit their navigation plan (as a class) to NASA experts for review. At the end of the Challenge, students will be asked to compare and contrast methods of navigating on Earth (at sea) and in space. For both parts of the Challenge, the essential question used to keep students on task is "How do you stay on course?"

Ames Research Center (ARC) is managing the mission, conducting mission operations, and has developed the payload instruments, while Northrop Grumman designed and built the spacecraft for this innovative mission. Ames mission scientists will spearhead the data analysis. This is a fast-paced, low-cost, mission that will leverage some existing NASA systems, Northrop-Grumman spacecraft expertise, and Ames' Lunar Prospector experience.

- Just like on Earth, water is a crucial resource on the Moon. It will not be practical to transport to space the amount of water needed for human and exploration needs. It is critical to find natural resources, such as water, on the Moon. The Lunar Crater Observation and Sensing Satellite (LCROSS) mission will begin the search for water, leveraging the information we learned from the Clementine and Lunar Prospector missions.
- By going to the Moon for extended periods of time before other bodies in our solar system, astronauts will search for resources and learn how to work safely in a harsh environment—stepping stones to future exploration. The Moon also offers many clues about the time when the planets were formed.

- Begin preparation, understanding:
- What the LCROSS mission is all about?
- What do we know about celestial navigation?
- **Educator Guide** is now available in .pdf format to registered participants

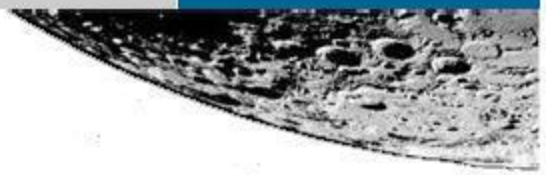
- **Task:** Students will be guided in charting a course from Kennedy Space Center at Cape Canaveral, Florida to one of the lunar poles using navigation skills appropriate for outer space.

  See also growing list of links to other online resources for research purposes.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

+ NASA Quest
+ Search Quest

FIND IT @ NASA : + GO



Exploration of the Moon Continues!

Home

Exploration through Navigation Challenge

Welcome to the Winter/Spring 2009 NASA Quest Challenge!
Explore Earth and Space Navigation Part II:
Charting a Course to the Moon

Final Webcast: Thursday, 5/7/09

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See the growing calendar of events below for planning purposes. Weekly challenge questions will be posed for 5 - 8th grade students to compete for prizes to deliver the best answer to us first.

Calendar of Events

Winter/Spring -- PART II: Charting a Course To the Moon (Educator Guide Available to Registered Teachers)	
Registered Yet? Registration for this Challenge has concluded.	
As soon as you are registered.	Begin preparation, understanding: • What the LCROSS mission is all about? • What do we know about celestial navigation? **Educator Guide** is now available in .pdf format to registered participants **Task:** Students will be guided in charting a course from Kennedy Space Center at Cape Canaveral, Florida to one of the lunar poles using navigation skills appropriate for outer space. See also growing list of links to other online resources for research purposes.
February 25 Opening Webcast  Watch the Archive	Watch the archive of this hour-long, informative webcast designed to help you in your exploration. Astronomer Brian Day and Science Journalist and Space Historian Andrew Chaikin help students learn more about navigation in Space.
March 30 Noon PDT 3 p.m. Eastern	**Classes submit navigation plan to NASA** (template on pp. 27 & 28 in educator guide, also available here in .doc and .pdf formats.) -- See online instructions on how to submit your designs **Preliminary designs were posted online in the order received**
Webcast April 1  8:30 - 9:30 a.m.	**Midway Point Q&A Webcast** for help along the way as you refine your design. See: http://quest.nasa.gov/challenges/lcross3/webcast_040109.html The chat room is up and linked. You may post your questions at any time before or during the webcast. We will answer as many question as time permits. If you are unable to take part in the live webcast, you can submit questions in advance to the chat room or send to: arc-quest-challenge@mail.nasa.gov and watch the archived video at a later time.
Beginning April 1: A Problem Situation! (this is not an April Fool's Joke!)	**Off Course!** You are the navigation officer on the LCROSS mission control team. You have just received new tracking data that says the spacecraft is off course and will miss its impact point by 10 kilometers! That is to say, the spacecraft will fall 10 kilometers short of the target crater. The Webcast April 1 introduced a problem scenario that is optional for students who like to take on a challenge. Student and Teacher detailed instructions are available on pages 31 - 40 of the **Educator Guide**. This new challenge may be adjusted to student level.

Weekly during the Challenge	**Challenge Questions** **Congratulations to the Winners:** Question #1: Bern Homeschool, Oakland California Question #2: Ms. Stoica's 9F class Question #3: Jacob and Kenny from Ms. Nelson's class Question #4: Ms. Stoica's 9I class Question #5: Rogers Home School Question #6: Ms Stoica's 7class See solutions to all challenge questions on the Question page
April 27	Deadline: Receive student final submissions and post to website *Sending Materials for the Website* ***Final designs are being posted in the order received***
May 7 Final Webcast: 10 a.m. Pacific 1 p.m. Eastern 1700 UT (GMT)	Join us as experts comment on your designs, including: • Remarks from our expert panel, • Astronomical content from Astronomer Brian Day, and • Overall route and special considerations from Andy Chaikin Visit the webpage to test your system well ahead of time to avoid missing this Closing Webcast.
Through end of May	We value your comments! After you have watched the Webcast, we would appreciate your feedback at Teacher Post-Challenge Survey Certificates will be made available to those who have completed the challenge.
June 1	Drawing for the Lunar meteorite (Achondrite) from amongst the classrooms that have completed their Navigational designs and have contributed to the evaluation portion of this challenge by filling in the Post-challenge Survey. **And the winners are:** Lunar meteorite to: Ms. Jamison's Sixth Grade, Workman Middle School, FL Tektite to: Ms. Purrell's 3 teams of 7th & 8th Graders, Numa Elementary, NV Tektite to: Ms. Stoica's 3 teams from TUDOR VIANU National High School of Computer science, Romania

- **February 25**

- Opening Webcast
  Watch the Archive

- Watch the archive of this hour-long, informative webcast designed to help you in your exploration.

  Astronomer Brian Day and Science Journalist and Space Historian Andrew Chaikin help students learn more about navigation in Space.

  March 30
  Noon PDT
  3 p.m. Eastern
- **Classes submit navigation plan to NASA**
  (template on pp. 27 & 28 in educator guide, also available here in .doc and .pdf formats.) -- See online instructions on how to submit your designs

  Preliminary designs were posted online in the order received

- **Webcast**
  April 1
- **Midway Point Q&A Webcast** for help along the way as you refine your design.
  See: http://quest.nasa.gov/challenges/lcross3/webcast_040109.html
  The chat room is up and linked. You may post your questions at any time before or during the webcast. We will answer as many question as time permits.

  If you are unable to take part in the live webcast, you can submit questions in advance to the chat room or send to: arc-quest-challenge@mail.nasa.gov and watch the archived video at a later time.

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  See solutions to all challenge questions on the Question page

- **April 27**
- Deadline: Receive student final submissions and post to website
  Sending Materials for the Website

  Final designs are being posted in the order received

- **May 7**

- Final Webcast:
- 10 a.m. Pacific
  1 p.m. Eastern
  1700 UT (GMT)
- Join us as experts comment on your designs, including:
- Remarks from our expert panel,
- Astronomical content from Astronomer Brian Day, and
- Overall route and special considerations from Andy Chaikin
- Visit the webpage to test your system well ahead of time to avoid missing this Closing Webcast.

- **Through end of May**
- We value your comments! After you have watched the Webcast, we would appreciate your feedback at Teacher Post-Challenge Survey
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  Tektite to: Ms. Stoica's 3 teams from TUDOR VIANU National High School of Computer science, Romania
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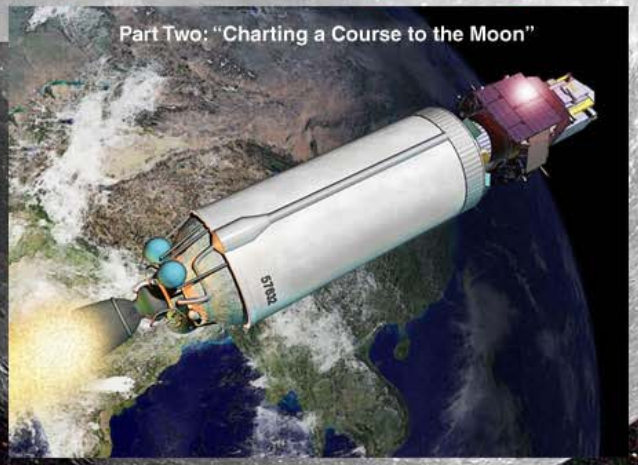
National Aeronautics and Space Administration

Certificate of Completion

Awarded To: Cristian Zaharia

For successfully completing the Quest Challenge

Exploration Through Navigation



Liza Coe
NASA Ames Education

Brian Day
LCROSS Mission E/PO Lead

December 9, 2008

References:

- http://lcross.arc.nasa.gov/education.htm
- http://quest.nasa.gov/challenges/lcross3/#
- http://spaceflight.nasa.gov/gallery/images/apollo/
- http://spaceflight.nasa.gov/gallery/images/apollo/
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