Traveling Back to the Moon with NASA's Digital Learning Network

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Abstract

The project that I was assigned for the summer required development of a new NASA Digital Learning Network module that was mathematically based and tied to NASA concepts/missions. This world of interactive learning with NASA's DLN is free, available to teachers and students across the country to learn more about our home planet. Digital Learning Network (DLN) Coordinators conduct modules to students across the country at various times convenient to schools throughout the year.

In order to understand the communication medium required to create a module and educate students, I trained with LaRC's DLN Coordinator and Assistant Manager to effectively present the module, Magnificent Sun, to several schools across the country using distance learning equipment housed at NASA LaRC and the school where the module was presented. The conduction of module presentations on a variety of K-12 student levels allowed me to practice/develop instructional and presentational skills through distance learning. Upon completion of the module presentation phase of my internship, inservice was conducted by DLN Coordinators at Kennedy Space Center and the Jet Propulsion Laboratory on how to develop a module.

Objectives of this module are to apply the National Mathematics Standards of ratio/proportions, scaling, area, and volume to NASA's space vehicle transport systems that will return to the moon. The module educates students in the middle grades on how America will send a new generation of explorers to the moon aboard NASA's Orion crew exploration vehicle. As part of the Constellation Program, Orion will send human explorers back to the moon, and then onward to Mars and beyond. The lunar excursion launch goal is intended for the year 2020. My module also educates the students on information about the Apollo program, and the space vehicles used during that mission.

Participants in this newly-developed DLN event will aid NASA in calculating the surface area, obtaining measurements of models, and use proportions to discover how/why NASA scientists have constructed the Orion, Ares 1, and Ares V vehicles. The students will also use age-appropriate mathematical calculations to fully understand related processes.

Participants are highly recommended to do a pre activity in preparation for the students to derive ratios and proportions in the conference activity. At the conclusion of the module presentation, students are asked to do a post activity, to evaluate what they have learning and retained from the presentation, along with a survey for recommendations for improvement for the module itself. My module will be posted to the DLN website and will be offered to teachers across the country, after it has been evaluated and approved for presentations by the DLN Coordinators.

Introduction/Background Information

The project that I was assigned for the summer required development of a new NASA Digital Learning Network (DLN) module that was mathematically based and tied to NASA concepts/missions.

NASA's Digital Learning Network began in the spring of 2004 with three Hub Sites (NASA Glenn, NASA Johnson, and NASA Langley) that are providing leadership and guidance in the expansion of the network to include all NASA education offices associated with its 10 field centers and NASA Headquarters. NASA's Digital Learning Network:

- fosters the effective use of interactive instructional technologies through the delivery of NASA educational content for the benefit of its students and educators.
- promotes collaborative activities among its member sites in order to optimize learning experiences for its students and educators.
- encourages open communication among its member sites so that expectations, limitations, strengths, and weaknesses can be objectively addressed for mutual improvement and positive development.
- provides timely responses to internal and external inquiries about technical issues, content development and delivery, and event scheduling.
- encourages innovation and experimentation by its member sites with the expectation that instructional integrity is maintained and NASA educational goals and standards are upheld.
- strives to reach targeted populations associated with the NASA Explorer Schools Program and other NASA distance learning initiatives that target underserved populations while providing access to appropriately equipped members of the general education community.
- participates in the development of an agency-wide infrastructure that makes use of existing and emerging interactive instructional technologies.
- contributes to the professional development of internal and external educators through the delivery of face-to-face and distance learning-based events.

NASA’s Digital Learning Network, a world of interactive learning, is free and available to teachers and students across the country to learn more about our home planet. Digital Learning Network (DLN) Coordinators conduct modules to students across the country at various times convenient to educators throughout the year.

Approach

In order to understand the communication medium required to create a module and educate students, I trained with LaRC's DLN Coordinator and Assistant Manager to effectively present the module, Magnificent Sun, to several schools across the country using distance learning equipment housed at NASA LaRC and the school where the module was presented. The conduction of module presentations on a variety of K-12 student levels allowed me to practice/develop instructional and presentational skills through distance learning.

In order to begin creating a math module it is important to, know the National Standards for School Mathematics and which of the standards are most needed. A survey was conducted by the NASA Explorer Schools project that assessed the top ten academic standards needs of schools across the nation. Using this data, it was determined that calculating ratios and proportions, area, and problem solving were mathematical areas that needed to be addressed the most in new module development. The DLN uses a standard template for module continuity when developing a module. When following the template it is important to know which age group to target, when planning the pre and post conference activities. After all conditions are met from the template and target the necessary standards, the DLN managers will approve or disapprove the module being posted to the DLN site. The approval and disapproval are based on the DLN module development rubric, which determines whether or not the module is properly written, formatted and contains all the necessary information to educate future viewers.

The module I developed connected the Apollo Program and the Constellation Program to ratios/proportions, scale factor, and area of the Space Vehicle systems that will be used for the missions involved.

I first researched and learned that the Apollo 11 was the first manned mission to land on the Moon. The Saturn V rocket launched, July 16, 1969 carrying Neil Armstrong, Michael Collins, and Edwin 'Buzz' Aldrin, Jr. On July 20, Commander Neil Armstrong stepped out of the lunar module and took "one small step" in the Sea of Tranquility, calling it "a giant leap for mankind." Innovation and improvisation were necessary, but there were five more missions that went on to land on the moon. Now, its time to go back to the Moon. NASA's Constellation Program is developing a space transportation system that is designed to return humans to the moon by 2020. The program components to be developed include the Orion crew exploration vehicle, the Ares I crew launch vehicle, the Ares V cargo launch vehicle, the Altair lunar lander and other cargo systems.

Secondly I discovered the reasons for the return to the Moon. Why go back to the Moon?

- The program is building the launch vehicles and spacecraft that will take a new generation of explorers to the moon, as well as lunar landers, habitats, life support systems, vehicles and robots to support them. There are six lunar exploration themes:

- **Human Civilization**: Extend human presence to the Moon to enable eventual settlement.
- **Scientific Knowledge**: Pursue scientific activities that address fundamental questions about the history of Earth, the solar system and the universe and about our place in them.
- **Exploration Preparation**: Test technologies, systems, flight operations and exploration techniques to reduce the risks and increase the productivity of future missions to Mars and beyond.
- **Global Partnerships:** Provide a challenging, shared and peaceful activity that unites nations in pursuit of common objectives.
- **Economic Expansion**: Expand Earth's economic sphere, and conduct lunar activities with benefits to life on the home planet.
- **Public Engagement**: Use a vibrant space exploration program to engage the public, encourage students and help develop the high-tech workforce that will be required to address the challenges of tomorrow.

Description of LaRC and/or NASA equipment, data, and facilities used to support the project

Participation in a NASA Digital Learning Network™ event is possible primarily through interactive videoconferencing. Videoconference provides real-time, two-way, audio/video connectivity via compatible hardware and software on both ends. In order to participate in a DLN interactive videoconference, you will need a video conference codec (coder / decoder) that is standards based operating in either or both of the following modes - over ISDN lines (H.320 standard) or over **IP** (the internet -H.323 standard). Standards based codecs are all compatible with one another in the same mode.

There are numerous manufacturers with these standards-based codec products including:

Tandberg	http://www.tandberg.net/products/index.jsp
Polycom	http://www.polycom.com/home/
Sony	http://www.sony.com/conferencesolutions
Aethra	http://www.aethra.com/worldwide/home.asp
VTel	http://www.vtel.com/
EmblazeVCON	http://www.vcon.com/

ISDN, which stands for **I**ntegrated **S**ervices **D**igital **N**etwork, is a system bonding together several digital phone connections that has been available for over a decade. This system allows voice and data to be transmitted simultaneously across the world using end-to-end digital connectivity.

IP, which stands for **I**nternet **P**rotocol is an identifier for a computer or device on a TCP/IP network. Networks using the TCP/IP protocol route traffic based on the IP address of the destination. Videoconferencing over IP eliminates per minute long distance calling charges (of ISDN) and is often preferred because it allows management of most or all communication technology on a single network.

Results/Conclusion

Because of the importance of the new missions, a new module supporting the newest exploration efforts had to be developed. Developing an educational module requires a great deal of research, staying current with NASA missions/explorations, and knowing how to formulate the module to target various age groups. Suggestions for future research of this project are to gear this module to students in the lower grades, finding the National Mathematics Standards that are required for their particular grade level and apply those mathematical concepts to teach the information provided in the module. The same method can be applied for those students in the higher grade levels, to target the mathematical concepts that are needed and required for their grade level.

References

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