Learning Technologies Project
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PROJECT DESCRIPTION
NASA's Learning Technologies Project (LT) is a NASA-wide education technology research and development initiative. LT supports the development of projects that deliver NASA content through innovative use of technology to enhance education in the areas of science, technology, engineering and mathematics (STEM). Research and development are at the core of the LT mission. Learning Technologies is one of NASA's eEducation Projects and is NASA's educational technology incubator. LT seeks to enhance formal and informal education in STEM fields with the goal of increasing the number of students in those fields of study. Learning Technologies combines the talents of educators, industry, academia, non-profit organizations and NASA's Mission Directorates to develop educational technologies that enable, empower, and educate learners of diverse backgrounds, characteristics, and abilities. The Learning Technologies project office is located at Goddard Space Flight Center (GSFC) in Greenbelt, Maryland. LT is a NASA-wide initiative with representatives and projects at several NASA Centers and an administrative structure incorporating each of the ten Centers in the decision making process. There are full-time project personnel at GSFC and Johnson Space Center (JSC).

PROJECT GOALS
1. Release of the Moon Base Alpha game demo: A demo with 20 minutes of game play developed on the Unreal 3 Engine and distributed over the Steam network with more than 23 million subscribers.
2. Finalize the negotiation of the Space Act Agreement for Astronaut: Moon, Mars and Beyond the massively multiplayer online (MMO) STEM learning game.
3. Recruit Subject Matter Experts across NASA to work with the game developers on content and accuracy of materials in the game.
4. Award proposals for the three categories of awards for the research solicitation to partner with the MMO developers. Category 1) to validate the effectiveness of the educational content and design of the NASA MMO; Category 2) conduct an independent evaluation of the educational gaming efforts of the MMO team; and Category 3) conduct research on the application of educational games and simulations in educational institutions with an emphasis regarding factors of diversity and individuals with physical disabilities.
5. Continue cross-cutting investments in R&D related to other K12 STEM Education projects, Higher Education Projects and Informal Education and expand across NASA Centers.
6. Increase the number of visitors to LT's virtual presence in the virtual world Second Life by 25%.
7. Establish a permanent NASA presence in the virtual world Second Life's Teen Grid.
8. Make recommendations to NASA's Education Office and K12 STEM project managers for establishment of social media communications plans to support 21st century education networking.

PROJECTS
NASA-based Massively Multiplayer Online STEM Learning Game Project: This is an effort to tap the power of virtual world games for the benefit of STEM learning and career exploration. This innovative project is being developed in partnership with the IPP Office using a multi-agreement, coordinated approach:

- **Developer Space Act**: In FY09, selection of a development team for the NASA MMO was made in the first quarter as planned. Space Act negotiations were delayed while Virtual Heroes underwent acquisition by Applied Research Associates and the new company, Project Whitecard and Wisdom Tools (formerly Information in Place) completed a legal agreement for the project. Negotiations are on track to result in the signing of a non-reimbursable space act agreement by the end of the first quarter of FY10. Work on the MMO is planned to begin immediately and result in playable alpha elements by early FY11.
- **Education CAN:** A cooperative agreement call in conjunction with the space act agreement solicitation to bring higher education organization to collaborate on pedagogical enhancement of the MMO project and to provide educational evaluation was released in FY09. Selections will be made during the first quarter of FY10. Awards are expected to coincide with the signing of the MMO space act agreement.
- **Subject Matter Experts (SMEs):** In FY09 the project office received high fidelity NASA Lunar Architecture models contributed by the ESMD's Advanced Concepts Lab to use as reference for in game designs. In FY10, Lunar SMEs will be engaged to work directly with the project.
- **Moon Base Alpha:** As a proof of concept and precursor to the MMO, a short multiplayer demonstration game will be release in the first quarter of FY10. Those who download and play the game will be encouraged to follow links back to NASA lunar educational and mission materials.

eEducation Roadmap: Support the continued dissemination and use of the eEducation strategic research roadmap to identify key eEducation research questions and technical requirements. Continue to build networks and partnerships across NASA, with other Federal agencies and commercial and academic organizations in the area of virtual worlds. In FY10, work will begin on a new roadmap to expand and update the original FY07 release.

Second Life: In FY09, LT establish the NASA eEducation Island as an outpost in the virtual world Second Life. The island facilitates LT virtual worlds research and acts as launching point for supporting other NASA education efforts seeking to engage the virtual world community. LT has helped the Lunar Reconnaissance Orbiter (LRO) mission, Classroom of the Future (COTF) and NASA's Interdisciplinary National Science Project Incorporating Research and Education (INSPIRE) project establish their own presence in Second Life and has supported the Digital Learning Network (DLN), Educator Resource Center Network, NASA Astrobiology Institute, the Jet Propulsion Lab(JPL) and Glenn Research Center in Second Life.

Push-Pull:
The LT Higher Education liaison worked directly with Higher Education outcome and project managers to make them aware of Learning Technologies goals and resources to foster collaboration. Opportunities for Higher Education to leverage LT resources are expected in Second Life and in the MMO project.

PROJECT BENEFIT TO OUTCOME
The NASA MMO project will eventually contribute to Outcome 2 in the area of providing NASA resources for students. The project is expected to benefit Outcome 2 in the following areas:

2.3.3 Number of approved materials that are electronically accessible

2.3.4 Customer satisfaction data regarding relevance of NASA educational resources.

2.3.5 Customer satisfaction data regarding effectiveness of NASA educational resources.

2.3.6 Use of technology to improve data collection, reporting strategies & dissemination

In addition, this solicitation will result in a project addressing objectives 1.1, 1.3 and 3.1 and PART measures regarding the number of individuals reached through eEducation media.

PROJECT ACCOMPLISHMENTS
Learning Technologies worked closely with the Innovative Partnerships Program Office to craft an original strategy for finding a partner to develop a NASA-based massively multiplayer online STEM learning game. The RFP resulted in 13 proposals which were reviewed by a nine member panel representing LT, the Innovative Partnerships Program Office, Legal, the Science, Exploration Systems and Space Operations Mission Directorates and three external experts working in the field of online games. The MMO project continues to drawn press attention in both print and web media. To date, more than 100 articles have appeared in education, science and game magazines and blogs.

The work of LT in virtual worlds for education was recognized in FY09 with an invitation to author a chapter in an upcoming work on the subject. In FY10, *Overcoming Objections to MUVEs in Education* will appear in a volume on Teaching with Multi User Virtual Environments from IGI publishing. LT has also been invited to contribute an article to the Journal of Virtual Worlds Research government edition.

The MMO Education CAN was released in FY09. Awards are expected to coincide with the signing of the development space act agreement in the first quarter of FY10.

The LT Higher Education liaison worked throughout FY09 to support the LT solicitation efforts, make Higher Education aware of the virtual resources coming online and lead the development of the education research and evaluation solicitation to be released in FY09 to support the MMO project. Opportunities for internships and research on the projects are being identified and cultivated.

Emphasizing LT's infrastructural role, the LT virtual worlds team at JSC was able to support several other Education and Mission Directorate projects coming online in Second life in FY09. LRO, COTF and NASA Glenn have all developed a presence in Second Life with support from LT. NASA's INSPIRE project has set up an island for their students on the Teen Grid with extensive LT help.

PROJECT CONTRIBUTIONS TO PART MEASURES
Individuals reached through NASA eEducation Resources:
    The Learning Technologies website:
- 165,381 Web Hits
- 1500% increase over FY08
    NASA eEducation Island in Second Life
- 14272 Second Life visitors
- 43% increase over FY08
- 13.47 minutes average visit
    Efficiency
- $3.23 per interaction*
- 95% reduction from FY08

Interaction cost is calculated using the NETS method of dividing the total number of interactions by the full project budget.

IMPROVEMENTS MADE IN THE PAST YEAR

Learning Technologies continued to work very closely with the Innovative Partnerships Program Office and the Legal Patent Office and Patent Counsel's Office at GSFC on a non-reimbursable space act agreement for the MMO. The concept and approach are both innovative and the process has required an extensive amount of interaction between the offices involved in this pioneering effort. The *NASA eEducation Roadmap: Research Challenges in the Design of Persistent Immersive Synthetic Environments for Education & Training* released in FY07 continued to guide LT planning and development in FY09. Other eEducation projects have also been using the roadmap to help guide their work, as have several external groups including the Defense Acquisition University, the Federation of American Scientists and Miami Science Museum and at least four proposers to the GCCE and K12 solicitations. The transition to a Portal website at http://www.nasa.gov/education/LT has contributed to an increase of 15 fold in LT web traffic. It is likely that continuing public attention to the MMO project also contributed to the increase. In FY09, the LT virtual worlds team transitioned from being a customer for virtual world expertise to supplying virtual world expertise to others. Funding for JPL support of LT in Second Life was withdrawn when it became evident that the LT team had developed more virtual world expertise than JPL possessed.

PROJECT PARTNERS

- Virtual Heroes/ARA, Project Whitecard and Wisdom Tools have been selected to negotiate a non-reimbursable space act agreement with LT and IPP to develop the NASA-based massively multiplayer online STEM learning game *Astronaut: Moon, Mars and Beyond*. In FY09 the team shared contacts, information and exhibit space and materials.
- LT participated in the *Federal Consortium for Virtual Worlds* as an active member building resource and information sharing networks for virtual worlds between government agencies.
- LT is collaborating with the Department of Defense on the Federal Virtual World Challenge for innovative applications of virtual worlds to government needs. DOD has the lead in organizing and publicizing the event and LT will be support with subject matter expertise.
- Valve, the owner of the Steam game distribution and support network will be distributing the MoonBase Alpha game. While LT funded the Virtual Heroes/ARA and the *America's Army* team involvement in the project, Valve has joined on a partnership basis. Steam is a free service with more than 23 million subscribers and Valve will be featuring MoonBase Alpha on their front page the week of release.
- The JSC Learning Technologies team supports LT efforts in Second Life, virtual worlds research, accessibility research, Social Media research and web design.
- The GSFC Innovative Partnership Program Office and GSFC Patent Law Office and General Counsel's Office are invaluable partners in developing and executing the concept of a targeted, non-reimbursable space act agreement for a solicitation tool for the MMO project.
- During FY09, the LT project office shared information and insights in the areas of game and virtual world technology with or on behalf of Informal, Formal and Higher Education, the Exploration Systems and Space Operations Mission Directorates, the DLN, COTF, INSPIRE, GSFC, Langley Aeronautics Research Center, Marshall Space Flight Center and Ames Research Center.
- LT has been working closely with National Oceanographic and Atmospheric Administration on virtual worlds research and application and plans to share space on the Second Life Teen Grid.