Moon Math Interactive Investigations

1. INTRODUCTION

This proposal is for a one-year project entitled Moon Math Interactive Investigations (MMII) that will leverage the NASA Learning Technologies (NLT) visual comparison tool "What's the Difference" (WTD) and will augment existing NASA Explorer School (NES) math investigations with two additional interactive mathematics investigations: planning a moon mission and designing a lunar habitat. New datasets and tools will be added to WTD to support these investigations including a graphing tool and a number of mathematical comparison benchmarks.

The NASA Ames Educational Technology Team (AETT), in partnership with the Collaborative for Higher Education, has already been awarded a two-year funding grant from NES to develop three interactive mathematical investigations for 5^{th}-8^{th} grade students. These investigations focus on NASA's human exploration mission by engaging students in the broad question of where to send humans. They leverage the $1.2 million NLT-funded WTD technology comparison tool developed by AETT. Leveraging this project and AETT's existing infrastructure make these proposed enhancements extremely cost-effective and ensure dissemination to underserved and underrepresented schools.

2. TECHNICAL PLAN

2.1 Customer Focus

Educational Need

Mathematics skills are fundamental to the engineering and science careers upon which NASA's human exploration mission will depend, yet NASA lacks human exploration and inquiry-based mathematics resources for teachers. The Trends in International Mathematics and Science Study (TIMSS) and National Council of Teachers of Mathematics (NCTM) have identified a need for materials integrating math and science and the American Association for the Advancement of Science (AAAS) has identified the need for high quality mathematics educational materials. "In a rigorous analysis of 12 middle school mathematics textbooks, only four recently published series received high ratings, while the other more well-established textbooks were rated as unsatisfactory, according to Project 2061, the long-term math and science education reform initiative of…AAAS," (Koppal, 1999). Furthermore, NES needs assessments reveal a need for resources on fractions, percentages, ratios, proportions, measurement, data analysis, and Earth in the solar system.

Most resources found in the NASA portal under Mathematics are focused on science standards, with the inclusion of some math skill activities such as graphing or computation. Because of high-stakes testing, mathematics is of major focus in schools, sometimes at the expense of science. Schools are hungry for mathematics materials that involve students in authentic applications of mathematics linked to science and engineering. In particular, finding innovative methods and tools to promote the teaching and understanding of pre-algebra is critical to the success of students who may be ill prepared, unmotivated, or lack confidence in math. NASA astronomy research and human exploration missions continue to pique society's interest, so MMII and WTD harness NASA science and real world science applications to capitalize on that interest and provide stimulating educational opportunities.

NES have identified specific mathematical and inquiry skills as high-need areas. Table 1 demonstrates these specific needs as identified by a minimum of 25 percent of the schools. The analysis found that the highest number of schools to identify any one standard as a high need area was 41 out of a total of 100. All identified standards will be met by the proposed investigations.

Table 1 – NASA Explorer School Needs

National Educational Standard	No. of NES indicating high need
Mathematics (National Council of Teachers of Mathematics NCTM)	
Number and Operations: Understand numbers, ways of representing numbers, relationships among numbers, and number systems*	25
Measurement: Understand measurable attributes of objects and the units, systems, and processes of measurement	28
Measurement: Apply appropriate techniques, tools, and formulas to determine measurements	29
Data Analysis and Probability: Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them	35
Geometry: Use visualization, spatial reasoning, and geometric modeling to solve problems	25
Algebra: Understand patterns, relations, and functions	25
Problem Solving: Build new mathematical knowledge through problem solving	27
Problem Solving: Solve problems that arise in mathematics and in other contexts	32
Communication: Communicate mathematical thinking coherently and clearly to peers, teachers, and others	26
Connections: Recognize and apply mathematics in contexts outside of mathematics	28
Science (National Science Education Standards)	
Earth and Space Science: Earth in the solar system	41

* The focus for numbers and operations standards in grades 5-8 is on conceptual understanding of fractions, decimals, and percentages.

Primary Audience

Students and teachers in grades 5-8 are the primary audience for the proposed educational deliverables of this project. This product will be developed for NES-specific needs, that represent the needs of many formal educators. The product will also be disseminated to grades 5-8 students and teachers outside of the NES network. It will be disseminated to the 150 NES via the Distance Learning Network (DLN), training of Aerospace Education Specialist Program (AESP) specialists, and at NASA Ames summer NES workshops. A Web site and CD-ROM will disseminate the product to all interested math teachers through NASA Quest (http://quest.nasa.gov) and NASA CORE. This leverages NASA Quest's 250,000 unique monthly visitors and NASA CORE's 4,000 monthly catalog downloads. Also, we will disseminate materials to K-12 educators on the Apple Learning Interchange (ALI http://www.ali.apple.com), which has 250,000 unique monthly visitors.

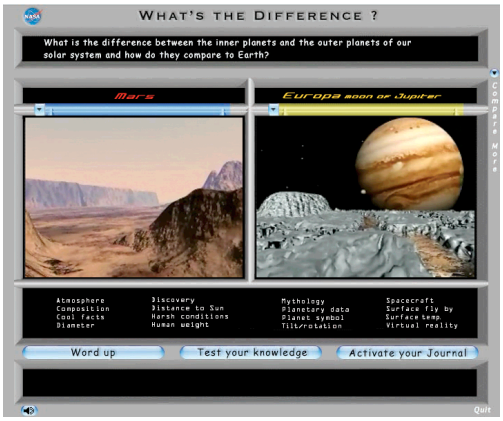
Delivery/Project Effectiveness

The proposed MMII project, based on WTD, meets the needs of recipients through instructional materials and technology learning tools that meet standards identified as high need areas by the NES, curriculum supplements using research-based methods, educational materials featuring NASA's new Exploration Mission, and professional development workshops for NES and other teachers.

MMII will extend from the NES-funded investigations to focus on the Moon as a stepping stone to the rest of the solar system. Investigations engage students in planning for a lunar mission and designing a lunar habitat. MMII modules teach mathematics via problem solving in a science context. MMII and WTD engage students in real science—making measurements, analyzing data, and solving mathematics problems in the context of human space exploration. The intended learning environment is grades 5-8 classrooms. The product may also be used in home schools and after-school programs.

2.2 Overall Project Plan

The NES-funded investigations focus on where to send humans, thus engaging students in this broad question fundamental to NASA's overall human exploration mission. Students use WTD to analyze solar system bodies as human destinations based on mass, distance, and mission costs. This relevant application allows them to learn about the solar system and apply a variety of mathematical skills including calculating and converting ratios, making measurements, and analyzing data.



Screenshot of What's the Difference (WTD) Main Interface

WTD is an interactive and visually engaging, educational comparison tool. WTD allows students to explore a question by bringing up side-by-side graphical comparisons of up to four planets or moons for a chosen feature. The tool also allows students to take notes in a printable journal and provides a multiple choice and open-ended assessment component, students answer based on their findings.

The additional MMII investigations, datasets, resources, and professional development being proposed focus on lunar exploration in general and life support and human habitation in particular. Students will first examine the greater solar system and learn the challenges of traveling great distances and surviving hazardous surface conditions. They then will be provided with a background on NASA's plan to pave the way for human exploration on Mars by beginning with the closest object to Earth, our Moon. Students will be given parameters for a moon mission in terms of mission length, number of astronauts, and resources for survival. Through two investigations, students will be asked to prepare for this Moon mission and then to design a habitat for the mission.

Proposed ESMD Content/Deliverables

- **Moon Mission Preparation**: Students will calculate the mass and volume required for their habitat based upon a given mission length. They will then use WTD to explore and compare characteristics of different 3-D shapes in terms of surface area, volume, and ability to withstand the radiation and pressure on the Moon. This investigation allows students to explore geometry math concepts, and to draw some conclusions about the best shape for a lunar habitat.
- **Lunar Habitat Design**: In this subsequent investigation, students use the shape and parameters defined by the Moon Mission Preparation investigation to draw a scale model of a lunar habitat. Students apply measurement, scale, ratio, proportion, 3-D geometric visualization, and volume calculation skills to design a habitat that will accommodate sleep, storage, work areas, and space for movement in-between these areas. Students use WTD to compare NASA research on possible lunar habitat designs. All investigations will include information on spin-offs and other benefits of ESMD research.
- **WTD Data Sets and Tools:** Related data sets, mathematical benchmark comparisons, and tool augmentation will be included in WTD to support the above investigations. Data sets may include:

shape characteristics, previous NASA research, and lunar conditions relevant to habitat design in comparison to conditions on Earth. A sample benchmark comparison might be the volume of a studio apartment compared with the volumes of different lunar habitats. A sample tool enhancement might be a tool to graph volume compared to surface area of various shapes.

- **ESMD Research Articles:** Background articles featuring ESMD research will be written at a 5th grade reading level. These include the lunar habitat work of Marc Cohen, human habitation biological research conducted in the centrifuge and the Life Sciences Glovebox by the Ames Center for Gravitational Biological Research and the Space Station Biological Research Projects Office, and technologies developed by the Ames Bioastronautics Research Division.
- **Career Fact Sheets:** Career fact sheets on ESMD experts will feature experts conducting ESMD research including John Fisher, Jason Otoshi and Vito Aguayo.
- **Pipeline of Links:** A Web page of links to related educational programs organized by grade range will help interested students further investigate related resources and programs. Links will include general student resources such as NASA student programs and specific resources related to Lunar Exploration, such as links to Student Observation Network, Living and Working on the Moon, and Home Sweet Habitat Quest challenge (pending funding).

Audience Accessibility

- **Distribution Web site and CD-ROM:** The NES-funded Web site and CD-ROM will be enhanced with the additional content proposed here. A golden master of the CD-ROM will be provided to NASA CORE for duplication so that teachers can obtain it for a nominal fee.
- **NES Training and Conference Workshops:** In addition to the NES-funded workshops, we propose two additional workshops through the Distance Learning Network to NES and other teachers across the country. (Workshops are offered to NES first and then opened up to other teachers.) We also will present this project to teachers at national educational conferences such as National Science Teacher's Association (NSTA), National Council of Teachers of Mathematics (NCTM), and National Education Computing Conference (NECC).
- **Apple Learning Interchange (ALI) Exhibit Web Page:** We will develop an online exhibit for this site directed at K-12 educators that features information on these investigations and links to the distribution Web site on NASA Quest.

Table 2– Deliverable Status

Deliverable	Status
Two investigations on moon exploration	New
Two new WTD datasets and benchmarks	New
Graphing tool augmentation (for graphs in MMII)	New
ESMD Research Articles	New
Career Fact Sheets	New
Web page with pipeline of links	New
ALI exhibit	New
NES Intro Lesson and three Investigations*	Design complete. Drafts complete 9/05.
NES WTD datasets and tools*	Research begun. Development starts 10/05.
Distribution Web site and CD-ROM**	To be developed once product is complete.
NES and AESP training**	To be developed once product is complete.
WTD comparison software/ solar system dataset***	Completed except portal integration

* Funded by NES and not subject to funding under this proposal

** Partially funded by NES, to be considered for additional funding under this proposal.

*** Funded by NLT and not subject to funding under this proposal

2.3 Relevance to ESMD Education Goals

The theme that ties all of the math activities together is NASA's human exploration mission. Students learn about NASA's mission as they consider habitation requirements for human lunar exploration missions. By focusing on NASA's high-profile exploration mission, this unique NASA content provides a context for engaging and relevant math problems. Since this is a new mission, NASA lacks educational materials in this area. This proposed work would help to provide such materials. The MMII project also meets the following objectives:

- Develop standards-based, research-based, interactive learning experiences and technology learning tools that meet the needs of NES.
- Improve middle school students' skills in targeted pre-algebra concepts.
- Develop math investigations that are enjoyable, authentic, age-appropriate, and help students feel confident with targeted math concepts.

2.4 Pipeline

Top-quality educational outreach can help increase science and math literacy in the US, inspire the future generation of scientists and explorers, and establish broad, ongoing support for NASA and its missions throughout society. Thus, this project will not only address the needs of NES, but will also fill a need of the agency. In addition, the career fact sheets on ESMD researchers will be designed to inspire and inform readers about science, technology, engineering, and math (STEM) career options at NASA. The Web page pipeline of links to related educational programs will provide a valuable resource for both students and teachers of all ages and will connect them to other NASA programs.

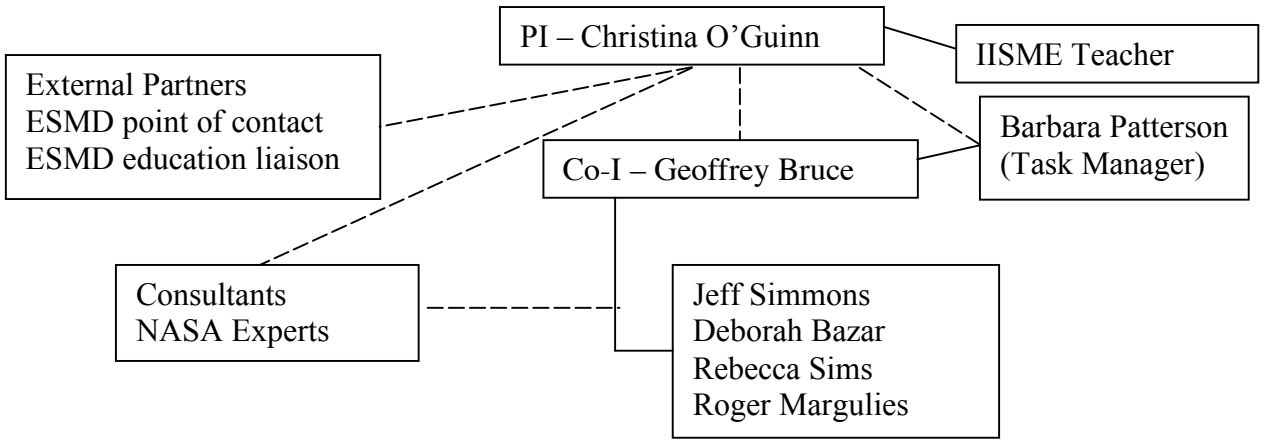
2.5 Diversity

AETT has extensive experience in developing lessons and multimedia products in local underserved schools. We have an English Language Development (ELD) specialist on staff and evaluate all technology products with high percentages of underrepresented students through a user test lab established at Fair Middle School in San José, California and other similar local schools. Fair Middle School has a population that is 61 percent underrepresented and 79 percent socio-economically disadvantaged. We will additionally select a diverse group of NASA experts to feature as role models.

MMII will be developed with components that address the Americans with Disabilities Act requirements for the visual and hearing impaired. WTD audio components will be added to the data set files for the visually impaired and supporting text descriptions will be added for the hearing impaired.

3. MANAGEMENT PLAN

3.1 Overall Management Plan – Descriptive Narrative



The above diagram demonstrates the lines of communication and reporting structure of the personnel working on this project. Solid lines indicate supervisory relationships, and dotted lines indicate lines of communication. Christina O'Guinn is the NASA civil servant who will act as the project lead and instructional designer for this project. All other listed personnel work for the contractor Planner's Collaborative. The roles, responsibilities, and qualifications of key personnel for this project are as follows:

Christina M. O'Guinn: P.I./Co-Lead, NASA AETT. **Responsibilities:** Primary point of contact (POC) for Ames ESMD POC, ESMD education liaison, Ames Office of Education, and partners. Will establish partnership agreements, serve as contractor task requestor and instructional design/curriculum developer, and will mentor summer IISME teacher. **Qualifications:** 4+ years as AETT Lead; 6 years as AETT instructional designer and curriculum developer; M.A., Instructional Technology; 4+ years teaching grade 5-8 underrepresented students; served as adjunct professor, CSU, Hayward.

Geoffrey Bruce: Co-I/Technical Director R&D. **Responsibilities:** Manage project technology development, programming and applications; develop dataset content, including graphics and animations. **Qualifications:** 7+ years as Technical Director/R&D Lead for NASA AETT; CADRE Institute M.A., San Jose State University.

Barbara Patterson: Task Manager, Planner's Collaborative. **Responsibilities:** Manage workforce; administer safety, productivity, and quality control functions; manage milestone and deliverable schedule. **Qualifications:** 3+ years as task manager; 18+ years program management with 7 years at director level.

Jeff Simmons: Multimedia and Technical Support/Database Manager. **Responsibilities:** Provide multimedia support; develop the distribution Web site; support user testing. **Qualifications:** 4 years with NASA AETT in multimedia and R&D support; M.A., Instructional Technology; middle school technology trainer.

Deborah Bazar: Educational Content Writer. **Responsibilities:** Gather multimedia content from experts and research; write age-appropriate content. **Qualifications:** 5+ years writing for AETT; B.S. Geology (SJSU in progress); community college planetarium show producer; education event manager; assistant editor of OnOrbit magazine.

Roger Margulies: Art Director. **Responsibilities:** Conduct page layout of lesson and articles, provide marketing communications expertise. **Qualifications:** 1.5 years AETT marketing/page layout; marketing communications manager, Philips Electronics, WebTV and TiVo.

Rebecca Sims: Evaluation Coordinator. **Responsibilities:** Coordinate user tests; compile and analyze results into a report with recommendations for improvement; coordinate/deliver conference and DLN workshops. **Qualifications:** 5+ years at NASA Ames; B.S. Education Interdisciplinary Studies; science and English teacher, Idaho Falls, ID.

Edward Landesman, Ph.D., Mathematics Consultant. **Responsibilities:** P.I. for NES-funded investigations; review instructional design blueprint and lessons for math accuracy and alignment with research-based instructional strategies. **Qualifications:** Professor Emeritus of Mathematics, UCSC; education director, Collaborative for Higher Education; created award-winning Interactive Mathematics series for Academic Systems Corporation.

Gina Liebig: Evaluation Consultant. **Responsibilities:** Review evaluation plan, instruments, and final evaluation report. **Qualifications:** Professional Evaluator, Center for Educational Planning, Santa Clara County Office of Education.

In addition, the following NASA-funded nanotechnologists will provide in-kind contributions in the form of technical content, guidance and subject matter expertise:

Marc M. Cohen, Arch.D, Aerospace Engineer, NASA Ames Systems and Projects Engineering Branch

Jason Otoshi, Lead, Life Sciences Glovebox Project, NASA Ames Space Station Biological Research Project Office, Life Sciences Division

Vito Aguayo, Experiment Coordinator and Facilities Engineer, NASA Ames Facility Utilization Office, Life Sciences Division

3.2 External Partnerships and Collaborations

The Collaborative for Higher Education (CHE)
Contact info: Nancy Bussani 408-924-1160 Nancy.Bussani@sjsu.edu
(UC Santa Cruz, San Jose State University and Foothill/De Anza College District): NASA Ames has an MOU with this organization. In-kind contributions include resources to support faculty time on the AETT Faculty Working Group providing product guidance and dissemination of AETT products via local professional development.

Industry Initiatives for Science and Math Education (IISME)
Contact Info: Jennifer Bruckner 408-553-2249 jbruckner@iisme.org
An IISME teacher is developing the NES-funded investigations. IISME teachers have supported AETT product development over the past five summers. IISME receives over $400,000 in in-kind support and corporate contributions for operational support including office space, computers, legal and other services, which is equivalent to $2,800 per IISME teacher fellow.

The Franklin-McKinley School District (FMSD)
Contact info: Susan Tacke 408-283-6043 susan.tacke@fmsd.org
Partnership through CHE to conduct user and pilot testing with classes in established computer lab. In-kind support includes resources to support maintenance and technical support of the computer lab. FMSD students are 96.8 percent ethnic minorities, 79 percent are socio-economically disadvantaged, and 54 percent are English Language Learners.

Apple Learning Interchange (ALI)
Contact info: Keith Mitchell 512-674-602 keithm@apple.com
NASA Ames has a formal legal agreement with Apple to support dissemination of NASA AETT products via their Web site for K-12 educators. In-kind support includes resources to review, house, and maintain all exhibits on the ALI Web site.

3.3 Schedule

Table 3 details the schedule of this project for both the NES-funded investigations and MMII. The schedule extends into FY 2007 because NES-funding covers this project through June 2007. However, the funding requested from ESMD is only for FY 2006.

Table 3 Schedule of Key Milestones and Completion Dates

	Oct-Dec, 2005	**Jan-March, 2006**	**April-June, 2006**	**July-Sept, 2006**	**Oct, 2006-June, 2007**
NES-funded Investigations	Complete Lessons	Classroom Testing	Revise	Layout/Launch	
ESMD Moon Math Investigations	Instructional Design/Research	Development	Classroom Testing	Revise/Layout/ Launch	
New WTD Datasets	Develop datasets for NES-funded investigations	Develop datasets for MMII	User/Classroom Testing	Revise/Launch	
New WTD Tools	Design	Development	User/Classroom Testing	Revise/Launch	
Web Site/ CD-ROM			Develop	Launch/Curate	Curate site
Professional Development			Plan/Prepare Workshops	NES/AESP Workshops	conferences NES DLN workshops

3.3 Metrics and Assessment

Quantitative Measures of Success (Outputs): Web statistics in the form of unique IPs, page views, PDF downloads, and time spent will be collected and reported to measure usage of Web-based content. In addition, the number of NES teachers and other teachers who participate in workshops will be collected and reported.

Qualitative Measures of Success (Outcomes):

The following metrics will be used to assess the effectiveness of this project in terms of successful infusion in NES and the success of the student's learning experience:

- More than 60 percent of participating NES teachers will indicate that they are somewhat or very likely to use the investigations in their classrooms.
- More than 70 percent of Aerospace Education Specialists who participate in a MMII/WTD workshop will indicate that the workshops adequately prepared them to conduct professional development workshops on MMII/WTD with NES.
- More than 70 percent of students will improve learning on post-tests compared to pre-tests.
- More than 60 percent of students will rate activities three or above on a Likert scale for increased understanding, comfort level, age-appropriate experience and engaging investigations.

The methods used to evaluate MMII will include user testing, classroom observations, and pre- and post-tests of student learning. The MMII project team will consult a professional evaluator from the Santa Clara County Office of Education to review the plan, instruments, and the final evaluation report. Testing and revisions will ensure that the product is proven prior to integration into the NES.

The evaluation will be largely conducted with one to three classes comprising more than 50 percent underrepresented students, located in the Franklin McKinley School District in San Jose, California. Additional user testing of the software will occur in other local schools with high percentages of underrepresented students. The NASA AETT team will make revisions to both the software and lessons based on these evaluations. The attitude instrument and evaluation model have been externally developed and tested in collaboration with the San Jose State University faculty through the Collaborative for Higher Education university faculty with help from teachers.

Reporting Plan: Program progress will be reported informally through Weekly Activity Reports and to the ESMD Ames Education Liaison. Program progress will be reported formally through quarterly reports. These reports will identify the status of all milestones and funding as well as available output and outcome data. These reports will include status of formal partnership agreements and partnership activities for that quarter.

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408.924.1160 phone
408.924.1168 fax

The COLLABORATIVE for HIGHER EDUCATION

July 18, 2005

Christina O' Guinn and Liza Coe
NASA Ames Research Center
Moffett Field, CA 94035

Dear Christina and Liza:

On behalf of the Collaborative for Higher Education, I am delighted to offer this letter of support to the NASA Ames Educational Technology Team (AETT. Silicon Valley is globally recognized for innovation and technology. Yet our region is also faced with a significant education and skills gap, and a critical shortage of scientists, engineers and teachers. The Collaborative, comprised of the three systems of public higher education, have joined together to address these issues. Formed in 2000 by the Chancellors/Presidents of UC Santa Cruz, San Jose State University, and Foothill-De Anza Community Colleges, the Collaborative leverages its resources and intellectual leadership to address Silicon Valley's demand for education and workforce development in the fields of science, technology, engineering and mathematics.

As part of our existing agreement with NASA Ames, the Collaborative has worked with the AETT by providing professional development of AETT products, establishing a testing computer laboratory in an underrepresented school in a San José middle school, and providing faculty expertise on evaluation methods, current educational pedagogy and in science, math and engineering content. This expertise has been provided to AETT in the form of an evaluation consulting committee and an AETT Faculty Working Group that reviews AETT products. We are eager to continue to support AETT in new projects and will provide in-kind cost sharing in the form of manpower to help with professional development, evaluation and faculty expertise. We are especially excited to work with AETT on products that feature NASA's human exploration mission.

We understand the need to excite and educate students in science, technology, mathematics and engineering in order to build our future science and engineering workforce. It is because of this shared goal, that we at the Collaborative for Higher Education are committed to working with NASA toward that end. We look forward to working with you on your proposed projects.

Sincerely,

Nancy Bussani
Executive Director

The Collaborative for Higher Education--a unique collaboration of education partners in Silicon Valley working together to develop student and teacher skills in science, technology, engineering and mathematics.

IISME
Future Connections
Summer Fellowship Program

INDUSTRY INITIATIVES FOR
SCIENCE AND MATH EDUCATION

July 20, 2005

Christina O' Guinn
NASA Ames Research Center
Moffett Field, CA 94035

Dear Christina:

On behalf of the staff and board of Industry Initiatives for Science and Math Education (IISME), it is my pleasure to convey our enthusiastic support for NASA's Moon Math Interactive Investigations proposal.

IISME is a non-profit collaborative of approximately 50 major San Francisco Bay area corporations, university labs, research institutions and 70-80 school districts annually. Our mission is to improve science and mathematics education and we focus on teachers as the primary agents of change. IISME provides local K-14 teachers with paid summer Fellowships in industry and research labs; Fellowships designed to equip teachers with new knowledge and the support they need to change how and what they teach. IISME has a 21-year history of success, awarding nearly 2,000 IISME Summer Fellowships since 1985.

Over the past five years it has been our pleasure to place high quality science and math educators at NASA Ames Research Center to work with the Ames Educational Technology Team on developing educator guides for eight weeks each summer. NASA Ames educator guides benefit from having experienced teachers who are currently in the classroom help with the development, and our teachers benefit from learning about exciting applications of science, math and technology that they take back to their students in the fall.

Currently, the NASA Ames Educational Technology Team (AETT) is hosting two IISME Fellows. One of these Fellows is currently developing math investigations for the NASA Explorer Schools. We understand that AETT is seeking additional support for this project to develop some additional investigations. We are eager to continue to support AETT in their important work and look forward to helping to identify high quality, teacher leaders to help develop the new products proposed. Our efforts and those of the NASA Ames team are highly leveraged; the IISME Summer Fellowship Program received over $400,000 in in-kind support ($136,000) and corporate contributions ($286,000) this year, which equates to approximately $2,800 per IISME Teacher Fellow.

We understand the need to excite and educate students in science, technology, mathematics and engineering in order to build our future science and engineering workforce. Because of this shared goal, we at Industry Initiatives for Science and Math Education are committed to working with NASA toward that end.

Sincerely,

Jennifer Bruckner
Executive Director

5301 Stevens Creek Blvd., PO Box 58059; MS 55L-WO Santa Clara, CA↔ 95052 ↔ Ph 408/553-2267↔ Fax 408/553-2889 ↔
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Franklin-McKinley School District

Enriching young people's minds

Larry Aceves
Superintendent

645 Wool Creek Drive, San Jose, CA 95112
(408) 283-6000 Fax (408) 283-6022

July 20, 2005

Christina O'Guinn
Liza Coe
NASA Ames Research Center
Moffett Field, CA 94035

Dear Ms. O'Guinn and Ms. Coe:

As the Director of Curriculum & Instruction for the Franklin-McKinley School District, I am involved with the implementation of grants and basic curriculum in the content areas. With our present population, which is comprised of 62% underrepresented and 79% socio-economically disadvantaged, we are eager to make every effort to increase the opportunities for students that will extend the diversity of our future science and engineering workforce.

Through the Collaborative for Higher Education, the NASA Ames Educational Technology Team (AETT) has established a computer lab in one of our schools, Fair Middle School, which has the representative population mentioned above. AETT makes use of this lab by conducting user testing of NASA educational technology products to ensure their appropriateness and accessibility of this audience. Several teachers in our District pilot test AETT lessons in their classrooms, and District teachers participating in the Collaborative for Higher Education Teacher Institute (CHETI) receive professional development in AETT products. Due to this very beneficial partnership, we would like to continue to work with and support AETT in the evaluation of new projects and teacher involvement in workshops provided as part of CHETI.

Therefore, to advance the academic collaboration of exciting and educating students in science, technology, mathematics, and engineering, we appreciate the opportunity to partner with NASA in achieving these goals and look forward to participating in future proposed projects.

Yours truly,

Sue Tacke

Sue Tacke
Director
Curriculum & Instruction

July 19, 2005
Apple Learning Interchange
12545 Riata Vista Circle
Austin, Texas 78727.

Christina Oí Guinn
Liza Coe
NASA Ames Research Center
Moffett Field, CA 94035

Dear Christina and Liza:

Apple provides the Apple Learning Interchange as a free online resource for educators. The site host exhibits of practice, learning activities, and video-based instructional programs contributed by our educational community, which encompasses both professional educators and institutions such as NASA, the Field Museum, numerous branches of the Smithsonian, and the National Park Service. We share a common interest with NASA in inspiring the next generation of explorers by increasing interest in and studies of science technology, engineering, math, and other academic disciplines.

In November 2003, we finalized an agreement with NASA Ames Education to disseminate content developed by the NASA Ames Educational Technology Team (AETT) via the Apple Learning Interchange. Since then, AETT has developed a number of online exhibits featuring NASA education content on ALI. Our audience of K-12 educators is always eager for new science, math and technology education resources and the exciting content that NASA provides. We are excited to continue this association and to feature new content focusing on NASAís human and robotic exploration mission.

We understand the need to provide current, engaging educational materials for teachers so that they might help to excite and educate students in science, technology, mathematics and engineering in order to build our future science and engineering workforce. We pleased to work with NASA to achieve this goal and look forward to helping to disseminate your proposed projects.

Sincerely,

Keith L. Mitchell

Keith L. Mitchell, Ph.D.
Senior Manager QuickTime and Digital Publishing

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, CA 94035-1000

Reply to Attn of: PMX 213-13

July 25, 2005

Christina O' Guinn
NASA Ames Research Center
Moffett Field, CA 94035

Dear Christina:

I am pleased to confirm that I am identified as a collaborator in your Exploration Systems Mission Directorate proposal entitled "Moon Math Interactive Investigations." I am eager to support the NASA Ames Educational Technology Team in developing Exploration-based mathematics investigations that engage students in planning for the return of humans to the moon. I am willing to provide in-kind cost sharing in terms of manpow to help with technical content, guidance, subject matter expertise and other material as needed to contribute toward the development of career fact sheets, lessons, articles and visual datasets.

The Systems and Projects Engineering Branch conducts research that is funded by NASA's Exploration Systems Mission Directorate and supports its goals. This research includes Habitat architectural design research including the living and working environment, habitability systems, habitat sizing, the Habot mobile habitat, lunar base configurations, the Suitport EVA Access Facility, and Mars Returned Sample Handling Systems. A special focus has been to develop a quantitative model of habitat size selection, based upon a rigorous geometry and conveyed in an Excel spreadsheet. This model takes into consideration the type of mission (shuttle, space station, lunar, interplanetary, Mars surface), mission duration, crew size, and quantitative requirements for habitability consumables. These factors contribute to outputs to find habitat sizin in terms of mass, area, and volume.

There is a need for current, highly engaging mathematics activities that allow students to apply standards-based skills to authentic problems. NASA's exploration mission offers a perfect opportunity to excite students i relevant math applications, thus strengthening their interest and confidence in science, math and engineering. am committed to this educational effort and we at the Systems and Project Engineering Branch would be delighted to work with you.

I am pleased to offer my expertise in Space Architecture (http://www.spacearchitect.org) research in support o this collaborative effort that you are proposing.

Sincerely,

Marc M. Cohen

Marc M. Cohen, Arch.D
Aerospace Engineer

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, CA 94035-1000

Reply to Attn of: MS 239-15

July 19, 2005

Christina O' Guinn
NASA Ames Research Center
Moffett Field, CA 94035

Dear Christina:

The Space Station Biological Research Projects Office is developing equipment that is funded by and supports NASA's Exploration Systems mission. The specific project on which I am working is the Life Sciences Glovebox. This equipment will provide an enclosed work-space, approximately half a cubic meter in volume, within which many types of biological experiments can be safely executed. The Life Sciences Glovebox is a versatile piece of equipment that is being designed and tested to primarily conduct experiments utilizing biological specimens. This will support research on physiological adaptations to microgravity and radiation vital to supporting human exploration missions.. Our project office is committed to education, has participated in presentations to the local elementary, middle, and high schools and has sponsored university students from local and remote universities to foster an interest in NASA's research and to enhance the science and engineering education of students.

I am eager to support the NASA Ames Educational Technology Team in developing Exploration-based mathematics investigations that engage students in planning for the return of humans to the moon. I am willing to provide in-kind cost sharing in terms of manpower to help with technical content, guidance, subject matter expertise and other material as needed to contribute toward the development of career fact sheets, lessons, articles and visual datasets. I am confident that the NASA Ames Educational Technology Team will successfully develop engaging, educationally sound content for dissemination to the NASA Explorer Schools. I am pleased to offer my expertise in project engineering and life science research in support of this collaborative effort.

There is a need for current, highly engaging mathematics activities that allow students to apply standards-based skills to authentic problems. NASA's exploration mission offers a perfect opportunity to excite students in relevant math applications, thus strengthening their interest and confidence in science, math and engineering. I am committed to this educational effort and we at the Space Projects Division of NASA Ames Research Center would be delighted to work with you.

Sincerely,

Jason S. Otoshi
Lead, Life Sciences Glovebox Project
Space Station Biological Research Projects Office
NASA Ames Research Center

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, CA 94035-1000

Reply to Attn of: MS 239-15

July 15, 2005

Christina O' Guinn
NASA Ames Research Center
Moffett Field, CA 94035

Dear Christina:

I work in the Life Science division's Facility Utilization Office (FUO) which operates and maintains centrifuges for the Center for Gravitational Biology Research (CGBR). These centrifuges are used by scientists to conduct experiments in support of NASA's Exploration Systems mission. The centrifuges range in size from 1-foot in diameter for cell culture experiments, to centrifuges large enough for people to live in. CGBR's overall science goal is to study the effects of altered gravity on biological systems. For example, scientists are studying how artificial gravity can be used as a counter measure for long duration spaceflight.

I am eager to support the NASA Ames Educational Technology Team in developing Exploration-based mathematics investigations that engage students in planning for the return of humans to the moon. I am willing to provide in-kind cost sharing in terms of manpower to help with technical content, guidance, subject matter expertise and other material as needed to contribute toward the development of career fact sheets, lessons, articles and visual datasets.

I am confident that the NASA Ames Educational Technology Team will successfully develop engaging, educationally sound content for dissemination to the NASA Explorer Schools. I am pleased to offer my expertise in engineering and knowledge of life science research in support of this collaborative effort.

There is a need for current, highly engaging mathematics activities that allow students to apply standards-based skills to authentic problems. NASA's exploration mission offers a perfect opportunity to excite students in relevant math applications, thus strengthening their interest and confidence in science, math and engineering. I am committed to this educational effort and we at FUO would be delighted to work with you.

Sincerely,

Vito Aguayo

Vito Aguayo
Experiment Coordinator and
Facilities Engineer