NASA Idaho Space Grant Consortium
University of Idaho
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PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The NASA Idaho Space Grant Consortium is a Designated Consortium funded at a level of $575,000 for fiscal year 2012.

PROGRAM GOALS

In order to consistently evaluate the NASA Idaho Space Grant Consortium annually, the vision, mission, core values and goals of the strategic plan are used as a guide for all programs developed and facilitated through the ISGC.

A. Vision

For all Idahoans to be engaged in NASA's missions of exploration and discovery by participating in a portfolio of education, research, and public service opportunities in the fields of space and aerospace science and technology, and related STEM disciplines.

B. Mission

The mission of the Idaho Space Grant Consortium (ISGC) is to provide easily accessible, flexible programs that focus on current and ongoing NASA initiatives that will benefit researchers; K-university students, teachers, and faculty in STEM fields; industry; the general public; the state of Idaho; and ultimately, NASA.

C. Core Values

The core values of the Idaho Space Grant Consortium are integrated in all ISGC programs and activities. They are 1) Communication, 2) Diversity, 3) Integrity, 4) Excellence, and 5) Teamwork.

D. Goals
Consistent with the three outcomes defined in the NASA Strategic Coordination Framework, the overarching goals of the NASA Idaho Space Grant Consortium are:

Goal 1) to contribute to the development of NASA's future workforce in disciplines needed to achieve NASA's strategic goals;

Goal 2) to attract and retain students, teachers, and faculty of diverse backgrounds in STEM disciplines;

Goal 3) to develop partnerships with NASA and related industries that provide the opportunity for Idaho students and professionals to contribute to the strategic research priorities of NASA, and to become engaged in NASA's mission.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1, 2, OR 3)

Outcome #1 (Employ and Educate)

- 30 students took next step in FY12 (SG participation supported from FY06-FY12 funds)
    - 6 are pursuing advanced degrees in STEM disciplines
    - 17 accepted STEM positions in industry
    - 7 went on to positions in non-STEM disciplines

Outcome #2 (Educate and Engage)

- In 2012, the ISGC continued to award scholarships on a graduated funding scale. As scholars continue within the STEM field and continue to meet the requirements of the scholarship program, their funding increases each year. The goal is to reward students who continue to remain in the STEM fields and perhaps provide an added incentive for students to remain in STEM.
- A dual enrollment class with Moscow High School continued to involve high school students and teachers in the ISGC Research Involving Student Engineers and Educators (RISE) program. Idaho RISE is a student high altitude scientific balloon program. The Idaho RISE class enrolled approximately 25 University of Idaho students for the fall 2012/spring 2013 semesters. In addition, one additional student participate in the RISE program but did not enroll in the class due to a time conflict.
- Students from Potlatch and Lewiston High School participated in the Idaho RISE program, and three students from Moscow High School received dual enrollment credit through the University of Idaho for their participation in the Moscow High balloon program.
- Six seniors in Mechanical Engineering and Electrical Engineering along with 2 graduate students participated in the ISGC 2012-2013 Robotic Lunar Exploration Program (RLEP). This program is a senior design capstone project that designs, develops, and tests hardware for future planetary surface exploration in collaboration with engineers in the NASA Ames

Intelligent Robotics Group (IRG). The Senior Design Team made an in-person presentation to the IRG at Ames Research Center.

- Idaho TECH is a program for 4th, 5th and 6th grade students. In 2012, 45 teams participated from around the state.
- The NASA ISGC in collaboration with the University of Idaho will host an Idaho Science and Aerospace Scholars capstone event in early June. We anticipate 20 students from northern Idaho to attend this one-day event.

Outcome #3 (Engage and Inspire)

- The NASA ISGC collaborated with the Clearwater Valley Upward Bound program for a weeklong engineering workshop. Twenty-three students participated in a hands-on rocket design and construction workshop in the summer of 2012. Of the twenty-three students, nine were from underrepresented groups and 17 were women.

PROGRAM ACCOMPLISHMENTS

OUTCOME 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals

Fellowships and Scholarships

- Improve the communication and collaboration between undergraduates, graduates, ISGC fellows, and aerospace researchers, NASA engineers and scientists, and NASA centers.

  The ISGC has worked to enhance communications and collaborations between students and researchers over the past year. More students have been involved with a more diverse combination of projects at many different NASA centers and industry. This past year students have been placed for internships as well as academic year research projects at three of the NASA centers (including JPL) and Boeing.

- The total number of undergraduate and graduate students proposing for ISGC support through the ISGC fellowship and scholarship programs will increase by 10% per year through 2015
  - **Metric:** Number of undergraduate students submitting applications for ISGC scholarships.

    In 2011-2012 the ISGC received 33 scholarship applications and in the 2012-2013 grant year the ISGC received 65. We are continuing to find new avenues to advertise and recruit applicants for this program. We have been working closely with the Idaho State Department of Education to announce the scholarship to high schools around the state. We have also made applications available to students in the states TRiO programs and the Idaho Science and Aerospace Scholarship participants. Our affiliates also work to advertise the

application in undergraduate STEM classes as well as science center camps and public showings.

- **Metric:** Number of graduate students submitting applications for ISGC fellowships.

  The number of fellowship applications received in 2011-2012 was 8 and in 2012-2013 we received 16. The ISGC is continually working to increase visibility at affiliate institutions as well as better advertising to graduate students around the state. We will continue striving to increase applicants through University Graduate Colleges and Science and Engineering Departments.

- By 2015, the proportionate numbers of underrepresented minority students receiving ISGC support through the scholarship and fellowship program will meet or exceed the proportions represented by demographics the state of Idaho.
  - **Metric:** Number of underrepresented graduate and undergraduate students receiving ISGC support.

Higher Education Enrollment Statistic	
Black	**1.0%**
American Indian and Alaska Native	**1.0%**
Asian	**2%**
Native Hawaiian and Other Pacific Islander	**1.0%**
Hispanic	**7%**
Women	**55.7%**

*Based Chronicle of Higher Education for the State of Idaho

The ISGC supported 10% underrepresented and 31% women undergraduate and graduate students through Scholarships and Fellowships in the 2012-2013 grant year. The ISGC is working closely with the offices of diversity at the affiliate organizations as well as the state department of education to identify areas in the state of high populations of underrepresented individuals to target for program advertising.

- By 2015, 50% of ISGC scholars will be involved in NASA related research through programs such as but not limited to the Idaho Research Involving Student Engineers and Educators (RISE), Robotic Lunar Exploration Program (RLEP), and rocket launch opportunities such as RockOn!
  - **Metric** Number of ISGC Scholars involved in NASA related undergraduate research.

Number of scholarship recipients involved in research activities – 16 of 29 total (55%) were directly related with ISGC research activities.

Higher Education

- By 2015 interdisciplinary and collaborative undergraduate courses will be offered at five higher education institutional affiliates in Idaho.
    - **Metric** Number of higher education institutional affiliates offering interdisciplinary and collaborative undergraduate courses

      Currently three institutions of higher education are offering interdisciplinary and collaborative undergraduate courses. University of Idaho offers Near-Space Engineering to students of all disciplines. Northwest Nazarene University offers a similar course that is tied to the high-altitude balloon program. Also, Boise State University offers a hands-on introductory engineering course geared at freshman in STEM disciplines.

- By 2015 the percentage of women and underrepresented minority individuals participating in ISGC higher education programs will meet or exceed state percentages.
    - **Metric** The total number of participants in ISGC higher education programs

      Total number of undergraduate and graduate students in ISGC Higher Education programs in the 2012-2013 grant year was 62.

    - **Metric** The number of underrepresented minorities participating in higher education programs.

      The total number of underrepresented minorities participating in ISGC higher education programs in 2012-2013 was three (5%). According to the Chronicle of Higher Education out of 85,201 students currently enrolled in Higher Education in the state of Idaho, approximately 9.3% are underrepresented individuals. The ISGC is working with the offices of diversity and other multi-cultural organizations at the higher education institutions to increase the diversity in our programs.

    - **Metric** The number of women participating in ISGC higher education programs

      The total number of women participating in ISGC higher education programs in 2012-2013 was 15 (24%). According to the Chronicle of

Higher Education, out of 85,201 students currently enrolled in the state of Idaho, approximately 55.7% are women. The ISGC is working with women faculty and administrators as well as institution chapters of the Society of Women Engineers and the Women's Center at the higher education institutions to increase the participation of women in our programs.

- By 2015 the total number of students participating in ISGC undergraduate research programs will increase by 15%.
    - **Metric** Number of ISGC scholars participating in ISGC undergraduate research programs each year.

      In 2012-2013, 16 out of the 30 (53%) scholarship recipients participated in ISGC undergraduate research. Last year we awarded 37 scholarships and 18 scholars (49%). participated in ISGC undergraduate research programs.

- By 2015 the number of higher education institutions participating in the ISGC RLEP, RISE, and/or rocket launch opportunities will be at least five.
    - **Metric**: The number of ISGC education affiliates with teams participating in Idaho RISE.

      Currently we have two institutions actively participating in the Idaho RISE - University of Idaho and Northwest Nazarene University.

    - **Metric**: The number of ISGC education affiliates with teams participating in Idaho RLEP.

      Currently the University of Idaho is the only affiliate institution participating in Idaho RLEP. When this program was created the ISGC intended to spread it state wide. However, after discussing this with affiliates it was decided that this funding would be used to support other similar programs that affiliates had begun. For example, Boise State University has begun a very successful Microgravity program. Therefore, even though there is only one RLEP program in the state, we supported two other similar programs in addition to the University of Idaho RLEP program.

    - **Metric:** The number of ISGC education affiliates with teams participating in rocket launch opportunities such as RockOn!.

      In the 2012-2013 grant year one education affiliate participated in RockOn!. Northwest Nazarene University sent representatives to the RockOn! Workshop in 2012.

- By 2015 the number of undergraduate and graduate students applying for summer and/or academic year internship programs with NASA or in aerospace industry will increase by 15%.
    - **Metric** The number of undergraduate and graduate students applying for ISGC-sponsored NASA and aerospace internship programs.

      Our baseline as set in year one of funding is 40 applicants. Due to the fact that we are unable to access OSSI: SOLAR, we do not have access to the number of NASA internship applications.

- By 2015 the percentage of women and underrepresented minority individuals placed at a NASA center or in aerospace internship programs will meet state percentages.
    - **Metric** The total number of participants in ISGC-sponsored NASA and aerospace internship programs.

      In 2012-2013 the ISGC supported 12 students for internships at NASA centers and industry

    - **Metric** The number of women and underrepresented minorities participating in ISGC-sponsored NASA and aerospace internship programs.

      Of the twelve students supported, three were female (25%) and three were underrepresented (25%). The state demographics based on the 2011 estimates in the US census are as follows: women – 49.9%, underrepresented – 15.5% including Asian. The ISGC will continue to strive to increase the women and underrepresented individuals participating in our programs by working with the offices of diversity and multi-cultural affairs at the higher education institutions as well as advertising to the local chapters of student organizations such as Society of Women Engineers, National Society of Black Engineers, and OELA.

- Engage 9 students from 3 higher education institutions in rocket flight opportunities.
    - **Metric** Number of students participating in rocket flight opportunities such as Rock On!.

      The ISGC supported thirteen students whom designed a two-fold experimental payload to launch on the 2013 RockSat-X Program.

- **Metric** Number of institutions involved.

  Although Northwest Nazarene University is the only institution involved other Idaho institutions are involved with other NASA research opportunities such as Microgravity University and the Intelligent Robotics Group at NASA Ames.

- Have two student led flight experiments that will fly by 2012 in a rocket flight opportunity.
  - **Metric** Number of student led flight experiments.

    In 2012 Northwest Nazarene University launched a payload as part of the RockSat-C program and they have been accepted to launch a payload in the summer of 2013 as well as part of RockSatX.

Idaho RLEP / NASA Ames

The Idaho Robotic Lunar Exploration Program (RLEP) was developed with the Intelligent Robotics Group (IRG) at NASA Ames Research Center in 2006. Each year, the Idaho RLEP program is led by two ISGC graduate fellows and involves an undergraduate senior capstone design team primarily comprising electrical and mechanical engineering students. In 2012, one of the Idaho RLEP Graduate Fellows was a woman engineering student. The team works with the ISGC graduate fellows and in collaboration with NASA research engineers to design prototype hardware for future robotic surface exploration of the moon and planetary surfaces. As advisors and technical mentors to a University of Idaho senior engineering design team, the RLEP fellows gain experience in project management and leadership, engineering design, research and development, technical communications, and networking. The hardware developed under the Idaho RLEP program provides Ames researchers with the opportunity to identify engineering design issues and constraints preliminary to the definition, design, and development of actual hardware.

In 2012 Team Tensegrity, a multidisciplinary team comprising six senior students from electrical, computer, mechanical, biological systems engineering, and physics designed a robotic tensegrity system. Tensegrity is a unique class of structures composed of axially loaded compression elements encompassed within a network of tensile elements and with similarities to biological systems and with improved compliance over traditional robots. The goal of the Team Tensegrity is to design and build a tensegrity structure that can collapse for storage, expand for landing, survive the impact of landing, and provide surface mobility. In April, 2013, Team Tensegrity spent two days at NASA Ames for technical presentations of the tensegrity robot design to Engineers in the Ames Intelligent Robotics Group, including NASA technical mentors Dr. Terry Fong and Mr. Vytas SunSpiral.

In 2012, the Idaho RLEP Tensegrity program directly contributed to the successful submission of a NASA Ames/University of Idaho proposal to the NASA Innovative Advanced Concepts (NIAC) program. The Ames NIAC BallBot project is for the development of descent, landing, and surface mobility tensegrity technologies for future exploration of planetary surfaces.

Idaho Near Space Engineering Program / NASA Ames

For the eighth year the University of Idaho offered the two-semester ENGR205/ENGR206 Near Space Engineering (Idaho RISE) interdisciplinary engineering course. The University of Idaho Near Space Engineering team funded through Idaho Space Grant continues to work with Marc Murbach, a research engineer at NASA Ames Research Center on a number of different flight projects. For the past several years, the University of Idaho balloon team has supported the development of and provided a flight capability for testing of an autonomous parafoil system called Snowflake. The Snowflake system is designed to be capable of self-navigated flight to a pre-programmed landing site. Developed by the Naval Postgraduate School and NASA Ames Research Center, the Snowflake team comprises research engineers from NASA Ames Marc Murbach, Josh Benton (a University of Idaho mechanical engineering graduate, recently hired by Lockheed-Martin), and Kenny Boronowsky (now at SpaceX).

In 2012 there were three University of Idaho RISE launches – May, September, and April.

The Idaho Near Space Engineering team continues to develop and refine new technologies and capabilities. The most important of these is the capability to communicate with and track the balloon payloads in flight using the Iridium satellite network.

In fall, 2012, Idaho RISE Students from Art and Architecture helped put on an Idaho RISE art show, displaying photographs of the Idaho and Eastern Washington Palouse from altitudes up to 85,000 feet. The art show was put on at a local art gallery for the university and Moscow communities to raise funds for the program and to raise awareness of the program. Plans are currently underway to present at North Idaho College in Coeur d'Alene during the fall semester, 2013.

Microgravity University:

Astronauts in prolonged space flight and bedridden patients experience bone density loss due to a lack of mechanical stimuli. The mechanisms by which cells transduce physical stimuli to chemical signals are poorly understood. The goal of this experiment is to investigate the molecular mechanisms of calcium flux in response to hyper- and microgravity. Thus, the "Weightless Wonder" is an ideal environment in which to conduct the experiment. The primary focus of this experiment is to determine if the pharmaceutical teriparatide will alter calcium fluctuation in response to hyper- and microgravity. The FDA approved pharmaceutical teriparatide is known to induce bone formation in bedridden and

osteoporotic patients. During the team's research, no references to the testing of teriparatide in hyper- or microgravity conditions were found. Research proposed by the 2012-2013 Boise State Microgravity Team will be the initial real-time exploration of teriparatide at the cellular level in hyper- and microgravity.

The team hypothesizes that changes in cytosolic calcium concentrations in response to hyper- and microgravity will be enhanced by the presence of teriparatide.

An original apparatus designed, built, and successfully flown by the 2011-2012 Boise State University team will be utilized to measure calcium fluctuations. Modifications will be made to the apparatus to more accurately monitor rapid calcium fluctuations. The modified version will include: (1) better image capture devices, (2) increased sample size, and (3) streamlined data analysis. To optimize cell culture conditions and data acquisition, specific ground experiments will be performed prior to the flight experiment.

This unique experimental design will improve understanding of molecular mechanisms of calcium signaling in bone cell response to gravitational changes. This understanding should lead to improved skeletal health for astronauts.

RockSat-X:
Northwest Nazarene University is working with RockSat-X, a NASA program that allows students full access to space, to perform three student led experiments. The first experiment will attempt to gather data on the rocket's temperature using infrared technology. The second experiment will test the durability, both structurally and electronically, of flexible electronic substrates in the cryogenic environment of space. The final experiment addresses the lack of a full de-spun flight launch video. A camera will be sent on the rocket and record the launch and flight. A program will then be written that will de-spin the video footage. The goal of the NNU RockSat-X program is to test technologies in space while also providing a valuable educational experience for the students.

Research

- The total number of undergraduate and graduate students proposing for ISGC research support in aerospace and space science fields will increase by 10% per year through 2015.
    - **Metric** Number of undergraduate students submitting proposals for ISGC research support.

      During the 2012-2013 grant year the ISGC supported one Microgravity team to participate in the Microgravity University at Johnson Space Center. The total number of undergraduate students on this teams was 7. We will continue to work to increase the

numbers of undergraduate students proposing for ISGC research support.

- **Metric** Number of graduate students submitting proposals for ISGC research support.

  The ISGC funded two graduate students for travel to conduct field research. We will continue to work to increase the numbers of graduate students proposing for ISGC research support such as NASA center visits or travel to national conferences.

- By 2015 proposals for research support (including student research support) in aerospace and space science fields will be received from at least five institutions of higher education in Idaho each year.
  - **Metric** Total number of higher education institutions proposing for ISGC research and travel grants.

    Four of the higher education affiliate institutions proposed for ISGC research and travel grants during the 2012-2013 grant year.

- By 2015 ISGC will provide research support to students from at least five higher education institutions within Idaho per year.
  - **Metric** Number of higher education institutions with students receiving ISGC research funding.

    Three of the higher education affiliate institutions received funding to support student research during the 2012-2013 grant year.

- By 2015 the total number of proposals for external NASA research funding will increase by 10%.
  - **Metric** Total number of proposals submitted for NASA research funding.

    Two proposals were submitted by ISGC researchers to NASA in the 2012-2013 grant year.

- Each year, all Research Seed Grants will include undergraduate students.
  - **Metric** Total number of ISGC Research Seed Grant proposals submitted for research funding.

    Six proposals were received by the ISGC for the 2012-2013 grant year.

  - **Metric** Number of undergraduates supported by ISGC Research Seed Grant awards.

A total of seven undergraduate students were supported by ISGC research projects.

- By 2015 the percentage of women and underrepresented minority individuals participating in the ISGC research infrastructure programs will meet state percentages.
    - **Metric** The total number of participants in ISGC research infrastructure programs.

      The total number of participants in ISGC Research Infrastructure programs was 20 (this includes faculty, undergraduate and graduate students).

    - **Metric** The number of women and underrepresented minorities participating in ISGC research infrastructure programs.

      Of the 20 people included in the ISGC Research Infrastructure program 10 of them were either underrepresented or women (50%).

LADEE / NASA Ames

For the fourth year, Idaho participated in the NASA LADEE (Lunar Atmosphere Dust and Environment Explorer) program with NASA Ames Research Center. An Idaho undergraduate engineering student spent the summer at Ames working on LADEE, a small satellite designed to orbit the equator of the moon to study the exosphere and dust. The Idaho summer intern worked with the structure team on several aspects of the design varying from designing flight equipment using Pro Engineering, testing the structure for flight readiness, testing and analyzing failure modes of the material, and compiling reports discussing the strength of the materials.

Small Satellite Radioscience Technologies / JPL

In 2012, Mr. Kamal Oudrhiri, a radioscience engineer, hosted two University of Idaho electrical engineering students as summer interns at JPL. Based largely on the research performed by these students, a senior design project funded by the JPL radioscience group) is being developed for the 2013-2014 year, and a JPL/Univ Idaho proposal for funding through the NASA Smallsat Technology Partnership program is being prepared. Mr. Oudrhiri will visit the University of Idaho for research discussions, to meet with the senior design team and to present a research colloquium in fall, 2013.

OUTCOME 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty

K-12 Education

- By 2015 the number of pre-service teachers participating in ISGC STEM initiatives will increase by 10% per year.
    - **Metric** Number of pre-service teachers participating in ISGC STEM initiatives.

      The ISGC had 15 pre-service teachers who assisted with the facilitation of or participated in the Summer of Innovation student workshops.

- The number of Special Project Grant proposals received from K-12 education affiliates will increase to five per year by 2015.
    - **Metric** Number of Special Project Grant proposals received from K-12 education affiliates.

      The ISGC was not able to fund any Special Project Grant during the 2012-2013 grant year to K-12 Education Affiliates as this was included in augmentation funding in past years.

- The number of Idaho teachers, students, and schools participating in ISGC Pre-College programs will increase by 10% by 2015.
    - **Metric** Number of Idaho schools participating in ISGC Pre-College programs

      Our baseline as set in year one of funding is 183 schools. In year three of our grant the number of schools decreased to 65. This decrease is due to less K-12 programs being administered by the ISGC due to decrease in funding.

    - **Metric** Number of students participating in ISGC Pre-College programs

      Our baseline as set in year one of funding is 1,421 students. In year three of our grant 1660 students participated.

    - **Metric** Number of teachers participating in ISGC Pre-College programs

      Our baseline as set in year one of funding is 210 teachers. In year three of our grant 76 teachers participated in our programs. This decrease is due to the reduced funding for K-12 programs.

- Visit the teachers from at least 6 schools that were a part of the 2010 IMU-SOI Summer of Innovation during the 2010 academic year.
    - **Metric** Number of schools visited

Our goals for school visits were met in FY 11. No further school visits have been made, but the SOI team has been in contact with numerous teachers, offering support over the phone and through digital media.

- Have 70% of the teachers that were a part of the IMU-SOI program implement NASA Curriculum in their classroom in 2010.
    - **Metric** Number of teachers using NASA curriculum.

      The exact numbers are still being evaluated, however we can safely say that through communications with our SOI participant teachers more than 70% of them have implemented IMU-SOI/NASA STEM education into their classroom.

- Engage 60 students with an intensive learning experience based on NASA curriculum at two school districts.
    - **Metric** Number of students participating in program.

      These goals were met in FY '11, however in addition, the SOI program returned to Salmon, ID for a second camp in 2012. Nearly 80 students participated at the Salmon camp.

      In addition to the camp funded by ISGC, the Space Grant supported SOI's endeavors at three additional camps in the summer of 2012. These sites included; Lapwai, ID, Owyhee, NV, Burley, ID and Potlatch, ID. Lapwai and Owyhee are both Native American reservations, and the vast majority of students at the Burley SOI camp were Hispanic. The Potlatch camp was held at a low-income and rural school.

    - **Metric** Number of school districts program offered.

      Though it was held in only one district, participants traveled to the Salmon camp and recruitment for the camp spanned multiple districts.

      Through a close partnership with SOI the ISGC was directly related to the success of all five camps, which reached four districts directly, with recruitment and traveling students from nearly 15 districts.

- Engage 25 teachers in intensive learning workshops based on NASA curriculum at two school districts.
    - **Metric** Number of teacher engaged in program.

These goals were met in FY '11, however the SOI program, with the support of the ISGC held one additional teacher workshop in the summer of 2012 in a rural, low-income school. The workshop reached 10 teachers.

The 2012 Best Practices Conference was attended by 40 teachers and held in July of 2012.

- **Metric** Number of school districts program offered.

  Teachers attended the workshop in Potlatch from one district, though the opportunity was provided to teachers throughout the Northwest.

  The 40 teachers that attended the SOI Best Practices Conference teach in 15+ districts throughout Idaho, Montana, Utah, Wyoming and Nevada.

- The total number student teams that participate in Idaho TECH will reach 60 teams in FY 2010.
  - **Metric** Number of teams participating in Idaho TECH

    During FY 2012, the ISGC had 35 teams participate in the Idaho TECH: Mars Rover Challenge. We are working with Idaho State University and College of Southern Idaho to enhance and increase participation in this program. We have also upgraded the LEGO kits with Infrared receivers and controllers as well as new pneumatics kits.

- The total number of student teams participating in *FIRST* Lego League will reach 300 teams in FY2010
  - **Metric** Number of teams participating in *FIRST* Lego League

    Idaho had only 154 teams (approximately 1000 students) participate in FIRST Lego League in FY2012. Although we did not reach our goal of 300 teams, Idaho's FIRST programs are growing each year and we are pleased to see such high participation numbers in this program.

- The total number of student teams participating in *FIRST* Tech Challenge will reach 35 teams in FY 2010
  - **Metric** Number of teams participating in *FIRST* TECH Challenge

    Idaho had only 32 teams (approximately 200 students) participate in FIRST Tech Challenge in FY2012. Although we did not quite reach our goal of 35 teams, FIRST Tech continues to add more and more teams

each year and the teams that participate are very competitive. Three of the FIRST Tech teams advanced to the World Championship.

Idaho Near Space Engineering Program / Moscow, Potlatch, and Lewiston High Schools

Idaho Space Grant continues to offer University of Idaho ENGR205/ENGR206 Near Space Engineering as a dual enrollment course to the math-based physics class at Moscow High School. Moscow High School dual enrollment students receive University of Idaho engineering credits for participating in the Near Space Program, and students who continue to the University of Idaho, participate in the University Near Space Engineering program, and declare an engineering major, are eligible for a RISE student scholarship.

Additionally, students from Lewiston High School (Lewiston, Idaho) and Potlatch High School (Potlatch, Idaho) participate in the 2012-2013 Idaho Near Space Engineering program. Potlatch High School is planning its first launch for May, 2013, possibly in tandem with the Moscow High School launch. The Lewiston team will fly an instrument as part of either the Moscow or Potlatch payloads.

Spaceward Bound / NASA Ames

In 2012 Idaho Space Grant participated with NASA Ames educators and researchers to offer Idaho Spaceward Bound to Idaho primary and secondary teachers. Twelve teachers, fifty percent women, received continuing education credits by participating in the one-week Spaceward Bound Idaho program. During Idaho Spaceward Bound 2012, researchers from Idaho State University, the University of Idaho, Idaho educators, and researchers from NASA Ames conducted field research at three sites in Idaho – Craters of the Moon National Monument and Preserve, Warswick Hot Springs, and Shoshone Ice Caves.

OUTCOME 3: Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission

Informal Education

- The number of Special Project Grant proposals received from informal education affiliates will increase to five per year by 2015.
    - **Metric** Number of Special Project Grant proposals received from informal education affiliates

      We did not receive any proposals from our informal education affiliates in 2012-2013. We continue to promote these opportunities and will work with our affiliates to increase participation.

The ISGC and SOI programs have teamed up to reach out to middle schools students visiting the University of Idaho from the North-West. We have implemented hour-long SOI/STEM/NASA workshops with these students as part of their campus preview. Thus far, 120+ have been involved in these mini-workshops. Of these students one group of 52 attended as part of their GEAR UP program focused on promoting higher education to Native students.

The ISGC was represented at a college/career fair on the Native reservation in Lapwai, ID. Throughout the day, 150+ students trickled through engaging in conversation about higher education, STEM education and research.

To summarize the accomplishments of the Idaho Space Grant Consortium:

- Successful disbursement of scholarships and fellowships throughout the state involving the Idaho higher education institutions and encouraging underrepresented students to take part in the program.
- Successfully involve undergraduate students in NASA related research projects, senior design projects, and internships with NASA centers across the country.
- Involve research faculty in NASA's missions and goals through seed funding and travel grants to visit NASA centers to initiate collaborations.
- Educate and involve K-12 students and teachers in NASA projects through Summer of Innovation, Spaceward Bound, Idaho TECH, and small grant opportunities.
- Support and involve Idaho affiliates through yearly meetings, personal visits, and small grant opportunities.

PROGRAM CONTRIBUTIONS TO PART MEASURES

Student Data and Longitudinal Tracking:

Total awards = 74; Fellowship/Scholarship = 45, Higher Education/Research Infrastructure = 29; 4 of the total award represent underrepresented minority F/S funding. During the FY12 program year 6 students are pursuing advanced degrees in STEM disciplines, 17 accepted STEM positions in industry, and 7 went on to positions in non-STEM disciplines. The remaining students have not yet received the degree that they were pursuing while the received their Space Grant award.

- Percentage of students whom have taken their next step and have been successfully tracked though their next step vs last year of SG support.
    - 56% for 2006
    - 81% for 2007
    - 100% for 2008
    - 100% for 2009
    - 94% for 2010
    - 100% for 2011
    - n/a for 2012 – all participants sill enrolled

    - 85% for 2006-2012
- 95% of students significantly supported by went onto next steps in STEM disciplines

Minority Serving Institution Collaborations:
Although there is no minority serving institutions in the state of Idaho, the ISGC has continued to develop its relationship with Salish-Kootenai College in Montana. Through the work of the previous Director (Navajo) and Associate Director, Ed Galindo (Yaqui), connections between this Tribal College and the ISGC have been established. Salish-Kootenai College is also a partner on the ISGC Summer of Innovation grant.

NASA Education Priorities:
Authentic, hands-on student experiences in science and engineering disciplines – the incorporation of active participation by students in hands-on learning or practice with experiences rooted in NASA-related, STEM-focused questions and issues; the incorporation of real-life problem-solving and needs as the context for activities.

The Idaho Space Grant continues to run a state-wide robotics competition for 4-6 graders called Idaho TECH: Mars Rover Challenge. This competition allows teams of students to design and assemble a robot made from Legos and other materials that will navigate a number of different challenges. These challenges include a hill climb, blind driving, rock collection, speed competition, and obstacle course that force the students develop a robot that is multidimensional. Include in the competition is judging based on the notebook that describes their process throughout the school year, their poster that displays their work, and their presentation on their design, challenges, and solutions. This provides a hands-on student experience in both science and engineering in their robot designs.

The Idaho Summer of Innovation (SOI) has also enabled 5-9th graders to experience NASA-related, STEM focused hand-on activities during a week--long camp experience. Although the Idaho SOI was from a NASA grant separate from the ISGC, the previous ISGC Director and current Associate Director were the PI's on this project, and implemented by the ISGC office. The focus was to encourage students to enter the STEM fields using NASA educational curriculum that cover rockets, robotics, cosmology, exercise and nutrition, aeronautics, and similar hands--on activities during the week. The ISGC will continue to search for outside funding to continue the great work that has started in the many communities that we have reached with the Summer of Innovation. We believe it will directly impact the ISGC by creating a pipeline of students from tribal reservations, Hispanic populations, and/or low-- income, rural areas that will become future students of the ISGC.

Diversity of institutions, faculty, and student participants.

Strategies that are overarching throughout Idaho Space Grant are competitiveness, diversity, and geographical distribution. All program funding opportunities, including research support, and scholarships and fellowships, will continue to place a high priority on competitiveness, with every effort to provide equable geographic distribution throughout the state. Additionally, Idaho Space Grant will continue to place a very high priority on recruitment and retention of underrepresented individuals, and will work towards engaging a diverse cadre of researchers, undergraduate and graduate students, K--12 students, and the general public participating in or impacted by ISGC programs. To provide for the most effective possible recruiting of potential program participants, Idaho Space Grant will strive to foster relationships with organizations that support underrepresented groups throughout the state.

Idaho is a large, rural state with a widely dispersed population, a growing number of underrepresented minorities, and lack of an in-state minority serving institution. Providing opportunities to students, educators, and communities in the most rural locations, and attracting participation from individuals from underrepresented groups, Native American and Hispanic students in particular, remain as high priorities and central challenges. Recent appointments at the University of Idaho and the signing of a Memorandum of Understanding (MOU) with 10 area tribes have opened the dialog for building strong, meaningful and sustainable relationships with Tribal colleges in the west, and these efforts will certainly continue. Contacts made with Salish--Kootenai College in Montana may allow the ISGC and Montana Space Grant to work collaboratively in serving this tribal college.

Engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise. Capabilities for teachers to provide authentic, hands-on middle school student experiences in science and engineering.

In addition to student activities associated with the Summer of Innovation, teacher workshops were also provided at limited sites in the summer of 2012 to help teachers infuse NASA curriculum into their classrooms. The online community continued to develop the website to give teachers another resource of curriculum and experiments to integrate into their classrooms. Many teachers have made several inquiries to Associate Director Galindo on items or expertise needed for their classroom projects.

The ISGC, in collaboration with NASA Ames supported teachers to participate in Spaceward Bound Field Expeditions in Idaho in June of 2012. During this weeklong trip, teachers were immersed in authentic scientific fieldwork so that they could bring that experience back to their classrooms. NASA Ames Education Specialist, Tony Leavitt, also worked with teachers to develop curriculum related to human exploration of remote and extreme environments. In the summer of 2013 teachers will be returning to Craters of the Moon, Worswick Hot Springs, and Shoshone Ice Caves for follow--up visits.

Summer opportunities for secondary students on college campuses with the objective of increased enrollment in STEM disciplines or interest in STEM careers.

Each summer the ISGC collaborates with the Clearwater Valley Upward Bound program to engage their students in a week long, hands-on engineering workshop. In this grant year, the high school students designed, fabricated, and launched rockets. University of Idaho faculty and graduate students led the week-long workshop and mentored the students in engineering and aeronautics concepts. Other programs the ISGC has supported specifically designed for secondary students are e-girls, sponsored by Boise State University, Idaho Space Days at the Discovery Center of Idaho.

Community Colleges – develop new relationships as well as sustain and strengthen existing institutional relationships with community colleges

The ISGC is currently working with College of Southern Idaho (CSI) and North Idaho College (NIC) to develop STEM projects for teachers. Currently, science faculty at CSI and NIC has been developing hands on science boxes (called MARS boxes) that teachers can build and use for their own classroom. CSI and NIC are working with Dr. Galindo to develop on-line STEM experiment's that will inspire the next generation of teachers and students. The College of Southern Idaho also played an integral part of Idaho TECH this this. The two community colleges are located in the north (NIC) and south (CSI) part of our state and this will help ensure state-wide STEM coverage.

Aeronautics Research – research in traditional aeronautics disciplines; research in areas that are appropriate to NASA's unique capabilities; directly address the fundamental research needs of the Next Generation Air Transportation System (NextGen).

The ISGC continues to support projects that appropriate to NASA's unique capabilities and to help serve the NASA pipeline, including

- Studies of a future Saturn Entry Probe mission to be proposed to Cycle 4 New Frontiers program (AO expected in 2014 or 2015),
- Studies of a future Titan Aerobot mission, the Titan Aerial Vehicle for In-situ and Airborne Titan Reconnaissance (AVIATR), to be proposed to a future NASA Discovery program,
- Support of students to attend and present research at the International Planetary Probe Workshop to be held in San Jose in June, 2013 and in Cologne, Germany (tentative) in June, 2014,
- Flywheel Energy Storage for future lunar surface missions,
- Robotic Lunar Exploration Program (RLEP) -- Mobile Tensegrity

Environmental Science and Global Climate Change – research and activities to better understand Earth's environments.

The ISGC is collaborating with this research group and will assist with recruitment of teachers and the organization of teacher workshops on the University of Idaho campus.

Enhance the capacity of institutions to support innovative research infrastructure activities to enable early career faculty to focus their research toward NASA priorities.

The ISGC continues to competitively award seed funding to faculty at research institutions around the state so help them develop their research geared towards NASA priorities. The purpose of the funding is to provide new faculty a start in their research within NASA's programs or established faculty that are redirecting their research to align with NASA's priorities. The goal is then for faculty and institutions to develop strong relationships with NASA's centers and the scientists and engineers at each center so that they can continue collaborative research efforts once the duration on the seed grants are complete.

Another item that the ISGC has continued to develop is the importance for Idaho's faculty to personally visit scientists and engineers at NASA centers. It is believed that a direct conversation between the faculty and those at NASA will help better focus the faculty's research so that it directly aligns with NASA priorities and they have a direct link in developing proposals for NASA funding. It has been observed that those faculty that have strong ties within NASA have stronger proposals and are more likely to be funded through the ISGC or NASA EPSCoR. The support for faculty that were supported in 2012-2013 came from supplemental EPSCoR funding so the ISGC did not use any funding to support faculty travel.

IMPROVEMENTS MADE IN THE PAST YEAR

This past year the ISGC went through a leadership selection competition between Boise State University and the University of Idaho. The end result of the process is that the University of Idaho will continue as the lead institution and Dr. Joseph D. Law will serve as the new director. The leadership selection process resulted in valuable feedback given to the UI leadership team from the consortium affiliates. To obtain more detailed information and improve relationships the new director visited each affiliate representative in person at their places of business during November 2012. The affiliates expressed a high degree of satisfaction with respect to the quality of programs being administered by ISGC. Improving communication, increasing shared governess, and being less University of Idaho centered were the three major areas that the affiliates stated that the ISGC leadership team needed to address. The new director is in the process of re-organization staff. Three positions are being eliminated and two new positions are being created. Idaho Space Grant Consortium is starting a process to generate operating guidelines and procedures for basic functions such as adding and terminating affiliate. No operating guidelines and procedures currently exist. Programs are being reviewed for the purpose of determining the extent of University of Idaho bias.

As part of the leadership selection the director negotiated with the University of Idaho College of Engineering for new office suite for ISGC. The new suite increase office space by 1200 sq. ft. and adds a 350 sq. ft. conference room. The additional office space permits the director and one associate director to be located in the same suite as the staff. The close proximity has enhanced internal communication within the ISGC leadership team. The conference room is fully equipped with video conferencing equipment, which will enhance communication external to ISGC.

The Idaho RISE program has also made an effort to be more interdisciplinary and has started to integrate art and architecture into the class. As described, students from Art and Architecture have started to consider how to present the art of engineering and science. The RISE program continues to integrate more science in the program. This year the students have been working with the College of Natural Resources and the Aquaculture Research Center to integrate a habitat for fish on the payload. This experiment will lead to research of sustainability of food sources on long duration space flight as well as on the International Space Station.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Academic Affiliates:

University of Idaho – Lead Institution – Founded in 1889, the University of Idaho is the state's flagship higher-education institution and its principal graduate education and research university, bringing insight and innovation to the state, the nation and the world. University researchers attract nearly $100 million in research grants and contracts each year; the University of Idaho is the only institution in the state to earn the prestigious Carnegie Foundation ranking for high research activity. The university's student population includes first-generation college students and ethnically diverse scholars. Offering more than 150-degree options in 10 colleges, the university combines the strengths of a large university with the intimacy of small learning communities.

Boise State University – BSU is an emerging metropolitan research university of distinction achieving its vision through academic excellence, public engagement, a vibrant culture and exceptional research. Reflecting the character of Idaho's capital city – a center of business, government, technology, health care and the arts, BSU is the largest university in Idaho with 19,667 students.

Idaho State University – a Carnegie-classified doctoral research high and teaching institution founded in 1901 in Southeast Idaho, ISU is the state's designated lead institution in health professions and medical education. ISU serves approximately 14,500 students annually in more than 280 academic programs in business, pharmacy, health professions, teach education,

engineering, arts and sciences, and applied technology training through the College of Technology.

Lewis Clark State College – Founded in 1893, LCSC is a public, undergraduate college with a history born of vision and commitment to people. The college serves a highly diverse population, providing educational opportunities to over 3000 students from more than thirty states and twenty countries. LCSC offers instruction in the liberal arts and sciences, professional areas tailored to the educational needs of Idaho, and applied technical programs that support the state and local economy.

North Idaho College – Founded in 1933, NIC is a comprehensive community college located on the spectacular shores of Lake Coeur d'Alene and the Spokane River. This public, higher education institution provides quality educational opportunities through offering associate degrees in more than 35 transferable academic majors and technical certificates or associate of applied science degrees in 26 professional-technical programs. NIC serves approximately 4,400 students annually.

College of Idaho – Founded in 1891, The College of Idaho provides a curriculum that is grounded in the liberal arts in a challenging, intimate academic setting. C of I is a private, liberal arts institution that provides an undergraduate education for more than 800 students in Caldwell.

College of Southern Idaho – CSI, a public, comprehensive community college, provides educational, social and cultural opportunities for a diverse population of South Central Idaho. In this rapidly changing world, CSI encourages students to lead enriched productive and responsible lives. The College of Southern Idaho is one of the fastest growing institutions of higher education in the state. CSI serves approximately 7,000 students annually.

Northwest Nazarene University – Founded in 1913, NNU is a private, Christian liberal arts university fully committed to an educational process that pursues both intellectual and spiritual development. NNU is committed to providing its students, both undergraduate and graduate, with an acquaintance with the major fields of knowledge through a study in the liberal arts. NNU serves approximately 1,400 students annually.

Brigham Young University – Idaho – BYU-Idaho's mission is to build testimonies of the restored gospel of Jesus Christ, provide a quality education, prepare students for lifelong learning, and maintain a wholesome academic, cultural, social and spiritual environment. This four-year private university, which is affiliated with The Church of Jesus Christ of Latter-day Saints, attracts students from all 50 states and more than 30 foreign countries. It currently serves approximately 11,000 students annually.

Informal Education Affiliates

Discovery Center of Idaho - DCI is an interactive science center providing exhibits and educational programs that offer authentic, sensory experiences making the sciences, math and technology tangible.

Palouse Discovery Science Center - The Palouse Discovery Science Center brings hands-on science and learning experiences to people of all ages. PDSC is a non-profit organization whose purpose is to further the public's understanding of science and technology through the use of educational programs, exhibits, teaching collections, and activities which emphasize the physical participation of individuals. The Center's offerings support and enhance science in both formal (such as school systems) and informal situations involved with life-long learning.

Warhawk Air Museum & NASA Space Place - The WAM Education Center, including the NASA Space Place Club, is a place where students of all ages can come to learn about World War II History from the warfront to the home-front and how the advancement in technology has had an impact on our society. Students will have an opportunity to learn about the changes that have occurred in America since the advent of man's first flight through the current aerospace developments.

Idaho Mobile Space Station – The IMSS was created in collaboration with the Idaho Dairy Council, ISGC, and former astronaut Tom Jones, among others. A converted semi-truck trailer was used to construct a portable Station that resembles components of the Shuttle, including a robotic arm, exercise bike, and an aviation flight computer program. The Station was designed for grades 5-8, and includes activities both in and out of the Station, such as "Toys in Space," access to astronaut food, etc.

Idaho Science Teachers Association – ISTA serves as the Idaho Chapter of the National Science Teachers Association. ISTA's membership includes science teachers, administrators, and scientists from across the state of Idaho. ISTA focuses on continually enhancing science education in Idaho, awarding outstanding science teachers in the state, and serving as a clearinghouse for resources through use of workshops, conferences, a newsletter, and a website.

Idaho Museum of Natural History - It is the mission of the Idaho Museum of Natural History to actively nurture an understanding of and delight in Idaho's natural and cultural heritage. As the official state museum of natural history, it acquires, preserves, studies, interprets, and displays natural and cultural objects for Idaho residents, visitors, and the world's community of students and scholars. The Museum also supports and encourages Idaho's other natural history museums through mentoring and training in sound museological practices.

Idaho Academy of Science – The IAS was organized in 1958 to further the cause of science and science education in Idaho. The IAS seeks to improve the effectiveness of science education in Idaho, and to promote public understanding and appreciation of the sciences and applied technology in the modern world. It is the only statewide organization in Idaho that embraces all scientific disciplines.

Eastern Idaho Engineering Council - This council was established in September 2001 to perform educational and charitable activities in the areas of engineering, science and technology; to provide a coordination role for inter-society events; to provide a resource upon which the member societies can draw for help in planning and executing various functions and events; to provide a forum for dialog and debate among the actively participating eastern Idaho sections of professional engineering societies; and to provide a single point of contact for outside entities that would like to obtain assistance or support from the engineering community.

Governmental and Industrial Associates

Bruneau Dunes State Park – The dunes at Bruneau Dunes State Park are unique in the Western Hemisphere. The Park is home to the largest single-structured sand dune in North America, with a peak 470 feet above the lakes. The Park is also home to the Bruneau Dunes Observatory, which houses several telescopes of various sizes that are available for use by the public.

Idaho Division of Aeronautics – The Division of Aeronautics serves to provide the highest quality, effective, efficient, and safe aviation system for all users of services, visiting or residing in Idaho. To this end, the division plans and implements necessary and desired products, programs, and services to develop, encourage and foster an outstanding aviation system that meets the current and future requirements of a growing and diverse Idaho aviation public.

Idaho Department of Education – Idaho's Department of Education was organized in 1891. Today, the Department is organized into an administrative section and six bureaus, and holds responsibility in a variety of areas. The department works in collaboration with the Idaho Board of Education in order to provide general supervision of Idaho's educational institutions and public school system.

Craters of the Moon National Monument & Preserve – Craters of the Moon is one of the best places in the world to see the awesome effects of volcanism. Established by Presidential proclamation in 1924, the Monument and Preserve encompass three major lava fields and 250,000 acres of sagebrush steppe grasslands. The rugged landscape remains remote and undeveloped with only one paved road across the northern end.

Idaho National Laboratory – In operation since 1949, the Idaho National Laboratory is a science-based, applied engineering national laboratory dedicated to supporting the U.S. Department of Energy's missions in environment, energy, science and national defense. Its mission is to deliver science-based; engineered solutions; complete environmental cleanup responsibly and cost effectively; provide leadership and support to optimize the value of EM investments and strategic partnerships; and enhance scientific and technical talent, facilities, and equipment. The INL works with higher education institutions, researchers, industry, and with students of all levels in a variety of capacities.

The National Space Grant Office requires two annual reports, this Annual Performance Data Report (APD) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.