

Priming the Pipeline Outreach Activities Summary

ESTEC's outreach activities targeted grades K-12 with age appropriate information, energy sector education and teacher support. During the grant, we offered a variety of activities targeted at various age groups.

K-6 grades

- ❖ Young Einstein's 2.5 hour workshops
12 events, 3,150 students, 170 teachers, 500+ parents, utilizes National Energy Foundation curriculum
- ❖ FIRST Lego League, regional qualifiers and state tournament coordination, more than 1,000 students over the life of the grant plus parents, coaches, and volunteers.

7-8 grades

- ❖ Summer Camps
annual events, day to week long, some have targeted female participants, others ranging from no electronics background to those with electronics background, some with a robotic theme, field trips to energy-related industry, utilizes National Energy Foundation curriculum
100+ students
- ❖ iSTEM
4 day institute, 12 teachers, utilizes National Energy Foundation curriculum

9-12 grades

- ❖ Energize Your Future-5 hour workshop
two events, five Alternative High Schools, Fort Hall Summer Youth Employment, 120 students, five teachers/counselors
- ❖ Current Challenge
annual event, 450 students (100+ students each year), students are enrolled in high school electronics programs

K-12

- ❖ Think Energy Idaho
two 2-day events, 140 teachers, utilizes National Energy Foundation curriculum
- ❖ Career Fairs/Tech Expo/Hardhats, Hammers, Hotdogs/Idaho Science and Engineering Festival/My Amazing Future/county fairs
multiple events demonstrating energy activities and concepts for recruiting students, thousands of participants annually

The Current Challenge

For the past five years, students enrolled in high school electronics courses take part in an annual event at Idaho State University known as the Current Challenge. The Current Challenge allows students from eight high schools to meet once a year at ISU and participate in a friendly competition of theory, technical skill, speed and teamwork. A traveling trophy goes from school to school based on the results of the total scores from school. In addition, three scholarships are available for 1st, 2nd and 3rd place winners of the technical skill competition if they enroll in the College of Technology. Each year more than 100 students take part in the day-long event with five schools participating in a given year.

In addition to the competitive activities, students have the opportunity to show and tell about the projects they have built in their electronics classes. Students also tour the ESTEC and Electronics classrooms and laboratories, talk with the CoT instructors and hear from current students enrolled in the programs. This is an excellent recruiting activity for ESTEC and helps build relationships between the high school students, the high school educators and ISU faculty and staff.

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FIRST Lego League

Idaho State University's College of Technology has hosted regional qualifiers for FIRST Lego League for five years. The Energy Systems Technology and Education Center (ESTEC) took over coordinating efforts four years ago. In addition, ESTEC and the College of Technology coordinated and hosted the state tournament in January, 2010.

FIRST Lego League (FLL) introduces students to real-world engineering challenges by building LEGO-based robots to complete tasks on a thematic playing surface. Geared for children in grades 4-8, FLL participants:

- Design, build, test and program robots using LEGO MINDSTORMS® technology
- Apply real-world math and science concepts
- Research challenges facing today's scientists
- Learn critical thinking, team-building and presentation skills
- Participate in tournaments and celebrations
- Build self-confidence, knowledge, employment and life skills
- Engage with their community
- May compete in tournaments and present their solutions to a panel of judges

Teams consist of up to ten children from the same class in school, schools (public, private, or home), churches, civic groups, neighborhood groups, after school programs, or just a group of friends getting together. Parents, teachers or community volunteers agree to coach the teams. Qualifiers and tournaments possess a sports-like atmosphere with judges and awards.

FLL Offers:

- Discovery of the fun in science and technology
- Real-world application of science and math concepts
- Hands-on problem solving
- Programming experience
- Research presentation project
- Adult role models
- Team activities guided by FLL Core Values
- Self-esteem and confidence

Hosting the qualifiers gives ESTEC an opportunity to talk to the participants about the importance of math and science in their education, about the option of technical education in the future, and of course technical careers. Many of the volunteers assisting at the qualifiers and state tournament are high school electronics students as well as students from one of our four ESTEC programs. The older students are great role models and mentors for the FLL

participants. Qualifiers have had up to 400 students participating each year as well as parents, coaches and numerous volunteers. Over the life of the grant, ESTEC has had contact with more than 1,000 students through FLL.

For more information on FIRST Lego League: <http://www.usfirst.org/default.aspx>

FIRST® LEGO® League (FLL®), created through a partnership between FIRST (For Inspiration and Recognition of Science and Technology) and The LEGO Group, inspires future scientists and engineers.

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Think Energy Idaho

Think Energy Idaho is a two-day professional development/teacher training workshop provided for Idaho K-12 educators by the Energy Systems Technology and Education Center (ESTEC) using curriculum obtained from the National Energy Foundation (NEF). The NEF provides curriculum, training and materials that promote a better understanding of energy, natural resources, and the environment.

ESTEC Executive Director and ISU's Tech Prep coordinator reviewed a variety of energy related curriculum before selecting the NEF curriculum. This curriculum offers excellent background information on electricity, where it comes from, how it is managed, sources of both renewable and traditional energy, conservation and efficiency all through age/grade appropriate activities and explanation. Think! Energy is an initiative from National Energy Foundation that invites all people to practice three main principles: Think, Talk and Take Action.

Trainers from NEF conducted the first workshop in June 2008 as a train the trainer workshop. Instructors and staff from ESTEC and ISU were on hand to learn the preferred method of presenting the various components of the curriculum. More than 75 Idaho educators attended this first workshop. A second workshop was held with ESTEC and ISU staff conducting the workshop. NEF staff were on hand for critique and support. More than 65 Idaho Educators participated in the second workshop.

Workshop objectives included:

- Integrate energy into educator lesson plans
- Hands-on participant activities
- Educators receive free classroom materials
- Educators learn about and explore energy career opportunities for students
- Enhance educator energy literacy
- Educators take part in an energy industry field experience
- Educators learn more about technical education and the educational opportunities available at ISU
- Earn 1-2 ISU continuing education credits (optional)

Participants selected the level of training they would attend upon registration: Primary, Upper Elementary, Intermediate, and grades 7-12. The workshop cost was \$20 to reserve their spot. Day one of the workshop involved learning about energy through grade appropriate hands-on activities and presentations. Participants learned about ESTEC, technical education and the energy careers students could choose to enter upon graduation. Day two involved a field trip to an energy facility. Workshop participants in Idaho Falls went to the Idaho National Laboratory. Participants in the Pocatello workshop went to a hydro facility owned by Idaho Power in American Falls. Participants attending the workshop in Pocatello were able to tour the classroom and lab facilities of ESTEC. Teachers were provided four posters for their classrooms, four issues of the Energist, Energy Action Activities curriculum, Energy Action Technology curriculum, Energy Fun curriculum and Energy Fundamentals curriculum, a tote bag, and a \$20 coupon for use in purchasing additional educational materials from NEF.

Follow-up support was provided for teachers interested in having ESTEC students come to their classroom and assist with the activities that were presented in the workshop. Applications were accepted from teachers and eight schools were selected. Each school selected received a \$200 stipend to purchase classroom supplies for the activities.

Additional workshops have been planned since the initial offering but have not been held due to lack of enrollment. However, the NEF curriculum is used in all of our K-12 educational efforts, (Young Einstein's, Energize Your Future, Summer Camps, etc.). We also use the NEF curriculum as part of the four-day iSTEM Institute offered in 2010 and planned for 2011.

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YOUNG EINSTEIN'S

In January 2009, the Idaho Department of Labor (IDOL) and the Energy Systems Technology and Education Center (ESTEC) along with its operating partners Idaho National Laboratory (INL) and Partners for Prosperity (P4P), came together to develop the Young Einstein's program in response to declining school budgets and the national emphasis on improving math and science skills among students K-12.

Young Einstein's addresses multiple outreach needs:

- 1) Provide teachers with relevant energy background, knowledge and experiments that apply to the Idaho Content Standards for Math and Science they are required to teach.
- 2) Provide support for teachers while they gain the knowledge, skills, and confidence they need to teach energy concepts in the classroom.
- 3) Provide an application-based learning environment for students in elementary schools for science and energy concepts
- 4) Provide parents and educators with educational and workforce options that permits continuous support and encouragement of science, math, and energy career pathways.
- 5) develop a critical pipeline for K-12 students to pursue higher education in STEM (Science, Technology, Engineering and Math) fields and ultimately STEM based occupations.

How a Young Einstein's event occurs:

When Young Einstein's was formulated, the planning committee determined that the program would be offered to no more than eight schools in a one year period. The sixteen county region served by P4P was separated into eight blocks of two counties each. Letters and applications were sent out to elementary schools in all sixteen counties asking them to apply for selection. One school per block would be accepted, and the following year, letters and applications would be sent to schools in the counties that were not selected in the first round of program efforts.

Criteria for selection include the completed application, the number of students receiving free or reduced lunch, and schools that can show that they are already working to improve STEM education in their schools, or at the very least, are working to integrate team learning styles. School size ranged from 85 to more than 450 students.

Following school selection, dates are arranged to hold the Young Einstein's events. A current ESTEC student works with a K-12 educator from each school to determine the National Energy Foundation curriculum experiments that will be used at the event. The ESTEC student provided necessary training to the K-12 educators prior to holding the event.

ESTEC uses the National Energy Foundation curriculum because of the variety of energy experiments it includes and its age/grade appropriateness for all K-12. The ESTEC Executive Director and the ISU Tech Prep Coordinator reviewed several K-12 curriculums before deciding on the NEF information.

The curriculum can be accessed at:

<http://www.shop.nef1.org/category.sc?sessionid=A4872352E27BABF6D94DDD8A32B78E30.qscstrfrnt02?categoryId=4>

One experiment example teaches students about hydrogen as a fuel of the future. Students use electrical energy from a battery to break apart water molecules into hydrogen and oxygen, allowing the hydrogen to be used as a fuel. Another experiment introduces students to the concept of static electricity and how it is created. Students observe the effects of static electricity through various objects such as balloons.

On the day of the event, three (or more) ESTEC students attend the event to assist the K-12 educators in presenting the chosen experiments and providing one-on-one assistance to the elementary students. ESTEC students take the science and math principles and concepts and bring them to life through fun and challenging experiments. K-12 students rotate through the selected experiments with each rotation lasting approximately 35 minutes.

Later that day or as an evening activity, parents are invited to the school for a review of the energy activities their child participated in and to listen to a presentation from the partner organizations regarding educational and workforce options available in Idaho and how to continue to support and encourage students in science, math and energy fields.

The parent activity plays a critical role for ESTEC student recruitment. Not only does it give parents the necessary information regarding the importance of science and math in their child's education, it also provides a clearer understanding of technical education available at Idaho State University, the career options available with an A.A.S. degree, and the earning potential with a short time investment. It serves as a way to reach un- or underemployed and underserved populations in a neutral environment. Not only does it target our youth, but it also targets the adult population ESTEC is trying to reach.

Young Einstein's began in 2009 with partial support received from the National Science Foundation under grant number 0703169. From January 2009 to April 2010, twelve different schools received the Young Einstein's one-day project, benefiting over 3,150 students across the twelve schools. Surveys were created for teachers and parents to provide feedback.

While longer-term results are difficult to track, the initial impact of the Young Einstein's program has been very positive and successful. The principal of Hawthorne Elementary school, which was the first school to receive the Young Einstein's program, reported the following success: "Hawthorne is a population of un and underrepresented students. Students eyes were opened to a whole new world as they had the opportunity to participate in an immersive

experience through which they learned to see the world through the eyes of a scientist, technician, engineer, and mathematician to solve everyday problems in their own lives using inquiry-based, problem-based, and higher order thinking methodologies. The program left the students, their teachers, and even their parents with courage, confidence, and character..." The principal of the school noted that some of the benefits of the program included better trained teachers, improvement among students in thinking critically and analytically, and more informed and educated parents who see new career opportunities for their child in careers involving science and math.

One of the keys to sustainability for this effort is the fact that each elementary school is provided with individual training to the teachers as well as a kit of materials and supplies that teachers can use on an ongoing basis to continue the experiments with additional or new students. The program places critical emphasis on educating teachers about how to teach the experiments and make them relevant to students within a classroom setting. Through this approach, teachers gain knowledge and skills that will allow them to more effectively reach and educate students well beyond the one-day program.

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i-STEM

i-STEM is a coordinated state-wide effort by the State Department of Education, Idaho Professional-Technical Education, educators, businesses, and industry to support science, technology, engineering and math (STEM) education in grades Kindergarten through 12th grade.

STEM Education is a new movement in American Education to help teachers and their students understand how the academic disciplines of Science, Technology, Engineering and Mathematics impact their world and prepare them for the workforce of tomorrow. STEM is multidiscipline based, incorporating the integration of other disciplinary knowledge into a new whole. **Technology** helps us communicate; **Math** is the language; **Science** and **Engineering** are the processes for thinking; all this leads to **Innovation**. STEM Education is more than just presentation and dissemination of information and cultivation of techniques. It is a process for teaching and learning that offers students opportunities to make sense of the world and take charge of their learning, rather than learning isolated bits and pieces of content. In the STEM environment, there is less emphasis on activities that demonstrate science content and a greater focus on those activities that allow students to engage in real world problems and experiences through project-based, experiential learning activities that lead to higher level thinking. Learning in a STEM environment compels students to understand issues, distill problems, and comprehend processes that lead to innovative solutions.

i-STEM believes teachers influence an infinite number of students and fill them with the knowledge and skills needed to make informed decisions that will not only impact the way we live, but our nation's resources and security. By joining together in partnership, we can support Idaho's educators and provide STEM professional development opportunities and resources for K-12 teachers which promote innovative thinking and powerful learning so students are motivated and competent in bringing forth the solutions to tomorrow's problems.

Objectives of i-STEM include:

- Identify, complement and collaborate with stakeholders to advance STEM in Idaho
- Identify Idaho's STEM education needs
- Build the bridge between resources and educators to fill the gaps in STEM education
- Promote the vital role of STEM education for Idaho's future
- Provide accessible state-wide STEM education resources through an IT network.

Reasons for STEM Education in Idaho:

- 13% of today's workforce is over 55 and by 2020 60% will be over 55.
- Over 70 million baby boomers will retire and they will be replaced by only 48 million workers.
- The need for science, engineering and technical training will increase by 51% this year.
- If the trend continues, by 2010 more than 90% of all scientists and engineers in the world will live in Asia.
- The top 10 most in demand jobs did not exist in 2004.
- India has more honor students than we have students in America.
- Fewer than 15% of high school students in the United States have an adequate skill base in science and math to pursue scientific and technical degrees.

- More than 50% of the engineering degrees in the US are awarded to foreign nationals.
- 60% of all new jobs in the 21st century will require skills possessed by only 20% of the current United States workforce.
- 21st century workplace and technical skills have become more important than land and buildings.
- Four of the 10 fastest growing industries and occupations from 2002-2012 are expected to be high tech.
- Quality Education is critical to the US's competitive placement in leading the world in innovation.
- Students have to compete globally, be more innovative, more inventive, and more efficient.
- A significant portion of our workforce finds itself in direct competition for jobs with lower-wage workers around the globe.
- Leading edge scientific and engineering work is being accomplished in many parts of the world.
- Thanks to globalization, driven by modern communication and other advances, workers in virtually every sector must now face competitors who live just a mouse-click away in Ireland, Finland, China, India and dozens of other nations whose economies are growing.
- Building skills in STEM disciplines, helps America and Idaho's students compete in the global workforce.

In January 2010, i-STEM partners, prepared and submitted an Idaho State Math and Science Partnership grant to secure partial funding to support the 2010 i-STEM summer institutes. The grant was funded and brought many expanded opportunities for professional growth for educators in support for enhancing STEM education in Idaho.

With the grant funding, i-STEM planned two statewide summer conferences which focused on STEM teacher development and used an approach that was tailored to address Idaho's unique geographical challenges that coordinates STEM efforts already underway in the State. ESTEC was invited to participate in the summer conference as a curriculum strand presenter at the i-STEM Educational Summer Workshop because of our existing commitment to Science, Technology, Engineering, and Math (STEM) education.

The i-STEM Educational Summer Workshops were held July 19-22, 2010 at two locations. ESTEC participated in the College of Southern Idaho Workshop in Twin Falls. The theme for the 2010 institutes was "Navigating the World of i-STEM: Focusing on use of Idaho Resources". Each workshop strand included twenty (20) hours of instruction and activities, and supported the daily general institute sessions organized for all participants at the institute.

Program Requirements included:

1. Inquiry Based Learning Activities are included in program
2. Cross Curriculum application is included in the training
3. Project Based Activities opportunities are included in the program
4. Contains elements on assessment of student learning
5. Show alignment to Idaho State Achievement Standards

ESTEC's strand was titled Power in Numbers. ESTEC Associate Director for Curriculum and Instruction provided the training using the NEF curriculum and tied the activities to multiple curriculum applications along with their alignment to the Idaho State Achievement Standards in Science and Math. Participants took part in a day long field trip to the Idaho Power Hydro facility located near Twin Falls. As part of the grant, each strand was required to provide a pre and post test for teachers in their strand. The test included cognitive knowledge about the information provided in the workshop. In addition to the NEF curriculum, i-STEM grant funding provided kits filled with supplies for each of the participants to provide the demonstrated activities to their classes. Additional teacher support has been provided throughout the year through on-line chat rooms and individual assistance.

Twelve teachers participated in the ESTEC workshop. More than 200 teachers participated in the two i-STEM institutes offered in 2010.

ESTEC was selected once again to provide training at the 2011 workshops that are planned for July, 2011. The theme for 2011 is the Magic of iSTEM.

For the most up to date information on i-STEM, visit: <http://www.sde.idaho.gov/site/istem/>

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Energize your Future

In a combined effort between the Idaho Department of Labor (IDOL) and ISU's Energy Systems Technology and Education Center (ESTEC), "Energize your Future" and Career Exploration was developed.

Goals of an "Energize Your Future" workshop include:

- 1) target alternative high schools and other areas that traditionally serve at risk students from disadvantaged backgrounds;
- 2) expose participants to energy related Science, Technology, Engineering and Math (STEM) education;
- 3) enlighten students regarding technical education opportunities throughout Idaho;
- 4) inform students of energy related career opportunities and earning potential.

"Energize Your Future" consisted of four hands on activities, career games, as well as a tour of ESTEC. The first workshop involved 65 students from alternative high schools throughout southeast Idaho, along with ten teachers/advisors. A second workshop involved 40 students from the Fort Hall Summer Work Program.

One counselor was exceptionally thankful saying, "Alternative high schools are quite often overlooked and it was a great feeling to know this event was held specifically for them." Of 45 students completing the student survey, 17 students indicated the workshop changed their opinions of technical education and several indicated an interest in an energy career. Those indicating an interest have been sent additional information and will be followed up with again to continue recruitment efforts. Additional events are planned for 2011 as funding allows.

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