2014 Idaho STEM Innovations Conference

Attitudes, Barriers, and Opportunities Concerning STEM Education in Idaho

May 28-29 at the Riverside Hotel Boise

Micron Foundation

University of Idaho

WELCOME

"Welcome to the Micron Foundation/University of Idaho's 2014 Idaho STEM Innovations Conference. If Idaho is to meet its need for a highly educated STEM workforce, we must all work together. State-wide research, funded by the Micron Foundation, provides us with a deep understanding of both differences across regions of the state as well as similarities. By coming together to share best practices, across institutions and organizations, we take a critical step to addressing the state's shortage of STEM graduates. Thank you for participating in this important conference."

Cori Mantle-Bromley
Dean, College of Education, University of Idaho

"The Micron Foundation is committed to helping our youth see how STEM plays a role in their everyday life and can be part of their future. As a co-sponsor of the University of Idaho's research initiative, we are excited to share the results which we believe can improve student experiences in STEM education and ultimately increase their success."

Dee Mooney
Micron Foundation Executive Director

Plenary Speaker

Linda Rosen, *Chief Executive Officer of Change the Equation, has over 35 years of experience helping to develop and implement innovative, strategic frameworks and policies that support high quality STEM teaching and learning, grades PreK-16. Her expertise is especially focused on scaling up research-based best practices and in helping entities adopt and adapt practices to ensure sustainability and success in STEM education. Dr. Rosen is a well-known national leader in STEM education with extensive experience working with key constituents, particularly around issues of teacher quality and rigorous standards. She provided leadership to the business community in its effort to support improved student performance in STEM as the Senior Vice President for the National Alliance of Business. During the Clinton Administration, she served as the Senior Advisor to Secretary Richard W. Riley on mathematics and science by providing counsel Department-wide on STEM initiatives and as the Executive Director of the National Commission on Mathematics and Science Teaching for the 21st Century (known as the John Glenn Commission).*

Keynote Speakers

***Donna Milgram**, Executive Director of the National Institute for Women in Trades, Technology and Science (IWITTS)* has dedicated her career to helping women succeed in fields that *have been traditionally dominated by men -- from engineering and auto technology to law enforcement and computer networking. In 1994, Ms. Milgram founded IWITTS, the only national organization whose sole mission is to provide educators and employers with the tools they need to encourage women to enter and succeed in careers where they are under-represented. Ms. Milgram has served as Principal Investigator (PI) for several National Science Foundation (NSF) projects and a National Institute of Justice grant.*

***Margie Gonzalez**, Executive Director of the Idaho Commission on Hispanic Affairs has sounded the call to action to bridge the Idaho Hispanic student academic achievement gaps that have existed for the past three decades. Ms. Gonzalez came to the Idaho Commission on Hispanic Affairs in 1998 to oversee the agency's substance abuse scholarship program. She was named Woman of the Year 2009 by Mujeres Unidas de Idaho, a U.S. Census Bureau 2010 State Partner of Year, and was among the Idaho Business Review's Women of the Year in 2011.*

***David Estrada,** Assistant Professor, Materials Science and Engineering, is a Boise State graduate where he was a Ronald E. McNair scholar. Estrada returned to the university last fall after earning his doctorate at the University of Illinois, Urbana-Champaign. David is the recipient of the NSF, NDSEG, SURGE, and Micron Graduate Fellowships. His work has been recognized with several awards, including the Gregory Stillman, John Bardeen, and Lieutenant General Thomas M. Rienzi graduate research awards. His research interests are in the areas of emergent semiconductor nanomaterials and bionanotechnology.*

***Sara Scudder**, Administrator for the Idaho Career Information System, is all about helping build careers in Idaho. Ms. Scudder previously supervised the department's Web Delivery Team, where she was responsible for planning, production and delivery of outreach content and materials for the Web, print and social media. Prior to that she supervised Occupational Employment Statistics and special research projects including a $1.25 million federal economic stimulus grant to improve labor market information and the 2011 Idaho Nursing Overview assessing education capacity, salary and recruitment issues. Ms. Scudder is a summa cum laude graduate of Auburn University in political science and has a master's degree in economics from California State University, Hayward.*

UI-Micron STEM Education Research Initiative

Year 1
- Thirty-nine focus groups of teachers, parents, and community members conducted in 12 counties

Year 2
- Statewide phone survey with 12 counties oversampled

Year 3
- Surveys of: students in grades 4, 7 and 10; their parents; random sample of teachers statewide
- UI retreat/workshop
- Innovations (presented in Parent: Amador, Latino: Maximillian, STEM: LaPaglia)

Year 4
- Innovations (presented in Gender: Anderson, Gender: Amador, STEM: Sotelo, Parent: Ekins)
- Conference in Boise to share findings, promote partnerships, and advance STEM education in Idaho

Year 5
- Completion of innovation projects
- Follow-up survey of students
- Share findings with stakeholders in Idaho STEM education

District Partners

The map shows the twelve communities selected to participate in focus groups and surveys of students and their parents. The adult and teacher surveys included randomly selected participants from the entire state.

Website

Website with reports, publications, and other information:

www.uidaho.edu/research/stem/micronstemed

Schedule

Day 1: Wednesday, May 28

All sessions in the Juniper/Laurel Ballroom except 2-4pm concurrent presentations

7:30-8:30 Registration and Continental Breakfast

8:30-8:45 Welcome Address

Dee Mooney, Executive Director, Micron Foundation

8:45-9:45 Overview of UI/Micron Research Findings

Melinda Hamilton, Director of STEM Education, University of Idaho

9:45-10:00 Break

10:00-12:00 General Session: Keynote Presentations

Closing the Gender Gap in STEM Fields

Donna Milgram, Executive Director of the National Institute for Women in Trades, Technology and Science (IWITTS)

Latino Culture - Added Challenges

Margie Gonzalez, Executive Director of the Idaho Commission on Hispanic Affairs and **David Estrada,** Assistant Professor, Materials Science and Engineering, Boise State University

STEM Career Awareness – The Disconnect

Sara Scudder, Administrator for the Idaho Career Information System

12:00-1:30 Buffet Lunch with Plenary Session Address: STEM Education Challenges in Idaho

Linda Rosen, Chief Executive Officer of Change the Equation

1:30-2:00 Poster Break: UI-Micron STEM Education Research Initiative Findings

2:00-4:00 Concurrent Presentations

Closing the Gender Gap in STEM Fields (Clearwater Room)

A. ***Building STEM Identity through Place-based Science***
Karla Eitel, McCall Outdoor Science School, University of Idaho; Jenny Schon, McCall Outdoor Science School, University of Idaho; Lee Vierling*; Greg Fizzell*

B. ***The Virtual World Village: Using Virtual Environments to Enhance STEM Awareness and Education to Middle School Girls***
John W Anderson, Virtual Technology and Design, University of Idaho; Jacob Cooper, Virtual Technology and Design, University of Idaho

C. ***Get in the Loop: Engaging Youth in Computer Programming with Scratch***
Heidi Pluska, University of Idaho and Boise School District; Roanna Barclay, Boise School District

D. ***Girls Can Build***
Kellie Dean, Director of Education, PCSEdventures, Inc

Latino Culture - Added Challenges (Delamar Room)

E. ***The Experience of Introducing Bilingual Science and Math Hands-On Activities to Head Start Children in Jerome, Idaho***
Jacqueline Maximillian, Environmental Science and Water Resources, University of Idaho; Ani-Alcocer Arreguin, Modern Languages and Cultures, University of Idaho

F. ***Engineering Pathways for Latino Students***
Diana Garza, Advising & Outreach Director, Boise State University; Leandra Aburusa-Lete, Student Success Coordinator, Boise State College of Engineering

G. ***Best Practices for Outreach and Engagement to Latino Audiences using Community-Based Programs***
Liliana Vega, Ada County Extension Educator, University of Idaho; Barbara Brody, Malheur County Extension Agent, Oregon State University

H. ***Boise State University LSAMP***
Emily Flores, LSAMP Coordinator, Boise State University

STEM Career Awareness – The Disconnect (Cinnabar Room)

I. ***"How I do STEM" – Community STEM Career Videos***
S Kirsten LaPaglia, STEM Access Upward Bound, University of Idaho; John Anderson, Virtual Technology and Design, University of Idaho; Janel Kerr, State of Idaho, Division of Professional Technical Education

J. ***Integrated Place-Based STEM: Local Context for STEM Career Awareness and Skill Development***
Anne Seifert, Idaho National Laboratory; Louis S. Nadelson, Education, Boise State University

K. ***Why Am I an Engineer: A Comparison of Data from Undergraduate Engineering Majors and Professional Engineers***
Louis S. Nadelson, Education, Boise State University; Janine Rush-Byers, Micron Foundation; Dee Mooney; Micron Foundation

L. ***ONEIdaho: How Idaho's Experimental Program to Stimulate Competitive Research (EPSCoR) is Bridging the Gap Between the Classroom and Careers in STEM Research***
Lee Vierling, Natural Resources, University of Idaho; Karla Eitel, McCall Outdoor Science School, University of Idaho; Shawn Benner*, Cindy Busche*; Carie Green*; Jairo Hernandez*; Eric Lindquist*; David Makings*; Brant Miller*; Sarah Penney*; Rosemary Smith*; Mark Solomon*

Parental Influence - How to Help? (Liberty Room)

M. ***Parents Press Play for Practices***
Julie Amador, Curriculum & Instruction, University of Idaho

N. ***Parental Influence on STEM: The 95 Percent Solution***
Jim Schmidt, PCS Edventures

O. ***Parents Have STEM Power***
Amy Christopherson, Director, Mini-Cassia Center, College of Southern Idaho

P. ***Cultivating Self-efficacy and Relationships through 4-H WeDo Robotics***
Will Boyd, 4-H Extension Science Associate, University of Idaho; Tim Ewers, 4-H Youth Development Specialist, STEM Education, University of Idaho

End of Day **Networking, Posters and Refreshments**

Day 2: Thursday, May 29

All sessions in the Juniper/Laurel Ballroom except 10am-12pm concurrent presentations

8:00-8:45 Registration and Continental Breakfast

8:45-9:45 Special Presentation of the play *Off the Record: Untold Stories of Women, Science and Engineering*
Boise State Theater Arts in conjunction with an interdisciplinary team

9:45-10:00 Break

10:00-12:00 Concurrent Presentations

Closing the Gender Gap in STEM Fields (Clearwater Room)

- ***Q. "It's NOT working": Women in Engineering and Computer Science***
  Amy Moll, Dean of the College of Engineering, Boise State University
- ***R. Changing Perceptions…One Girl at a Time***
  Diana Garza, Advising & Outreach Director, Boise State University; Leandra Aburusa-Lete, Student Success Coordinator, Boise State College of Engineering
- ***S. Digital Innovation Generating New Information Technology***
  Julie Amador, Curriculum & Instruction, University of Idaho; Terence Soule, Computer Science, University of Idaho

STEM Career Awareness – The Disconnect (Cinnabar Room)

- ***T. Assessing Professional Identity of STEM Majors***
  Louis S. Nadelson, Kimberly McAdams, Sharon McGuire*, Arvin Farid*, Kirsten Davis*, Raj Nagarajan*, Sasha Wang*, Uwe Kaiser*, Yu-Chang Hsu*
- ***U. Idaho ROKS: A K-12 Series of Programs in Which Youth and Adult Mentors Experience Science and Engineering Through Robotics.***
  Tim Ewers, 4-H Youth Development Specialist, STEM Education, University of Idaho; Will Boyd, 4-H Extension Science Associate, University of Idaho
- ***V. Promotion of Educational Opportunities and STEM Career Pathways: Lessons Learned in Designing an Awareness Campaign***
  Jessica Sotelo, Executive Director, Partners for Prosperity; Chris Guthrie, Workforce Development Specialist, Partners for Prosperity

STEM Career Awareness – The Disconnect (Delamar Room)

W. Creating a Regional Workforce for Rural Manufacturing: Linking Technical Education Systems and Students to Local Business
Raymond Dixon, College of Education, University of Idaho

X. Research Experience for Undergraduates (REU) Programs at Boise State University and Their Initiatives To Generate Interest in STEM Fields
Liljana Babinkostova, Department of Mathematics, Boise State University

Y. Engineering and Technology Education 2+2 Program to Bring STEM Career Awareness to Idaho students
Dave Campbell, University of Idaho - Twin Falls; Raymond Dixon, Education, University of Idaho; John Cannon, University of Idaho - Boise; Terry Patterson, College of Southern Idaho

Z. Hitachi STEM Outreach Programs and CTEq Participation
Robert Gordon, Sr Exec Distribution Network Development, Hitachi High Tech America; Mike Toalson, Western Analytical Solutions, LLC, representative for Hitachi

Parental Influence - How to Help? (Liberty Room)

AA. Lakeland School District iSTEM from Excellence
Jim Ekins, University of Idaho; Sarah Halsted, Lakeland School District

BB. Young Children at Play: How Parents Can Facilitate Early Math and Science Learning as Their Children Play
Harriet Shaklee, University of Idaho Extension

CC. Science Education Obstacles and the Emergent Nature of Culture
Jon Bender, Mechanical and Biomedical Engineering, Boise State University

*additional author not presenting

12:00 Conference concludes

Presentation Abstracts

A. Building STEM Identity through Place-based Science

Karla Eitel, McCall Outdoor Science School, University of Idaho; Jenny Schon, McCall Outdoor Science School, University of Idaho; Lee Vierling*; Greg Fizzell*

Improving STEM education and literacy is critically important in Idaho, especially for young women. Yet like the rest of the country, Idaho is challenged to prepare students for STEM careers and to meet the growing demand for innovation in science, technology and engineering and to lead problem-solving in the 21st century. In Idaho, we see a decline in interest in STEM careers from 4th to 10th grade, especially for women. Nationally, almost 40% of the students who enter college intending to pursue a STEM career do not actually persist. Researchers have pointed to "STEM identity" as part of the explanation for student persistence in or attrition from the STEM pipeline. STEM identity is concerned with how students conceive of STEM, who does STEM, and the relevance of STEM to solving problems that are meaningful to them and their communities. Strong STEM identities develop when women have a chance to be involved in STEM activities, when they build STEM skills and feel competent, and when they are recognized as STEM people by the STEM community, and when they are positively recognized as STEM people by their social communities. Countering negative stereotypes about girls in STEM careers begins within the family and peer community and girls' personal interaction and support in participating in STEM related learning activities. The University of Idaho's College of Natural Resources McCall Outdoor Science School – or MOSS – has built a reputation of delivering strong inquiry-based STEM programming for more than 12 years and serving over 20,000 students. This presentation will explore the ways in which MOSS has designed its curriculum to help build girls' STEM identities through collaborative field science experiences that help female students and teachers think about ways to solve problems in their own communities while building connections to each other and a broad community of scientists. MOSS staff will present their program philosophy, examples of specific implementation and research findings from programs designed specifically for young women and their co-ed programs that encourage STEM identity for everyone. These findings will be placed into the broader conversation of supporting increased diversity in the STEM fields and the ways in which out of school learning might support this important objective.

B. The Virtual World Village: Using Virtual Environments to Enhance STEM Awareness and Education to Middle School Girls

John W Anderson, Virtual Technology and Design, University of Idaho; Jacob Cooper, Virtual Technology and Design, University of Idaho

The percentage of girls that decide to follow educational paths leading to STEM employment declines significantly as they enter middle school and high school. A high percentage of girls engage with STEM topics, like to solve problems, question how things work, and have a great interest in making the world a better place. These interests align with STEM professions; however girls continue to lose interest in the application of STEM as they mature. Many studies have concluded that this decline may be due to the lack of understanding in how STEM careers align with personal education goals, and the overall knowledge of what STEM career paths are available to them.

The intent of the Virtual World Village (VWV) is to elevate the utility of virtual educational environments so that they better target females' educational interests in sustainability, enhance overall STEM awareness, and provide contextual experiences for a variety of possible STEM career paths. The VWV provides a learning platform that will allow students, parents, and teachers the ability to engage in STEM related exercises while they solve authentic problems. The viability of the village is dependent on the ability of the students to study, develop, and implement solutions to problems they are presented with. The VWV provides students with engaging, interactive activities that contextualize STEM concepts and connect them to other STEM domains. There is a multitude of potential scenarios—they could for example, take the role of a villager faced with a water shortage, a tsunami victim faced with water contamination, or an engineer tasked with

designing a wind farm to provide power to the village. The VWV fosters peer interaction as students collaborate to develop models and critique potentially viable solutions to real world problems. One intended outcome is that as students interact within the VWV they collect and interpret information to manage real-world problems which increases the students' interests in STEM fields as they see their efforts making a difference in a sustainable future. This is corroborated by others who found that interactive technologies are capable of presenting authentic, experimental approaches to STEM problem solving, and have potential to excite all students, especially minority and female students.

C. Get in the Loop: Engaging Youth in Computer Programming with Scratch

Heidi Pluska, University of Idaho and Boise School District; Roanna Barclay, Boise School District

The goal of this project was to evaluate the degree that an after school enrichment program utilizing the Scratch programming media tool could impact student learning and their perceptions of computer programming. Moreover, because of computer programming's close kinship to mathematics, it was also our goal to investigate the impact of this program on students' perceptions towards mathematics. Finally, we sought to examine differences between girls and boys across each of these areas. The evaluation of the following research questions served to guide the implementation of our project, assess the degree to which our goals were met, and inform refinements to the curriculum and overall program to ensure its subsequent implementation across similar settings.

How does an after school enrichment program utilizing Scratch impact student learning of programming concepts? How does the impact on student learning compare across girls and boys? How does an after school enrichment program utilizing Scratch affect students' self-efficacy and perceptions of computer programming and mathematics? How does the effect on students' self-efficacy and perceptions compare across girls and boys?

This project targeted 7th to 9th grade students at a Junior High Students during the spring semester of the 2013-2014 school year. The school selected was located in a financially under-resourced urban area in Boise, Idaho and had a total enrollment of 613 students, 66% of whom qualify for free or reduced lunch and 25% of whom are minority. Boys and girls who enrolled in the program were separated into two cohorts. There were a total of 9 boys and 8 girls. The basis for separating boys and girls stemmed from a wealth of research on the male dominated culture of computing and the differences in learning styles known to exist between these groups.

Preliminary data suggest that the utilization of Scratch does have a positive impact on student learning of computer programming concepts and on their self-efficacy and perceptions of computer programming. These results were consistent across boys and girls. Funding acknowledgment: This project was funded by a grant through the University of Idaho Doceo Center.

D. Girls Can Build

Kellie Dean, Director of Education, PCSEdventures, Inc

The statistics are startling. There are 50 percent fewer females represented in careers in computer science than men. Women make up only 24 percent of the STEM jobs in the United States. Only 5 percent of girls aged 8 to 17 were interested in a career in engineering, according to an American Society for Quality poll. This drastic disparity between men and women in the STEM industry must be addressed. Strong, smart, innovative young women around the nation are discounting themselves from these professions at a young age. PCS Edventures (PCSV) is committed to empowering female students and encouraging them to pursue an education in the STEM industries. PCS has released the Girls Can Build program and curriculum, developed with hands-on STEM education, leveraging the most current neuroscience research on how humans learn. As a leader in the STEM education industry, PCS produces a non-traditional learning framework designed to create highly effective, individualized STEM learning experiences, extensive robotics and engineering curriculum, robotics software designed solely for K12 education, robotics hardware, turnkey engineering and technology labs, and a library of K12 content related to STEM. This presentation will demonstrate how the Girls Can Build program and

curriculum is effective in introducing K-6 girls to STEM concepts in the classroom and afterschool programs, sparking a passion for learning and an interest in the STEM fields. PCS puts a direct focus on both the empowerment of girls to develop an interest in these exciting and innovative areas, while also fostering a community of respect, understanding, and support. Whether learning takes place in the classroom, afterschool programs, or at home, PCS Edventures is committed to supporting young women to think, reach, grow, learn, and most importantly, believe in themselves.

E. The Experience of Introducing Bilingual Science and Math Hands-On Activities to Head Start Children in Jerome, Idaho

Jacqueline Maximillian, Environmental Science and Water Resources, University of Idaho; Ani-Alcocer Arreguin, Modern Languages and Cultures, University of Idaho

Closing STEM gaps among states, income groups, gender, and race is an educational endeavor relentlessly pursued by government and private institutions at federal, state, and local levels, as well as families and individuals. In 2012, the UI-Micron STEM Education Research Initiatives research revealed that parents are instrumental in closing this gap; although in Idaho, they possess insufficient math and science skills, and are crippled by the fear and mistrust of science. The situation is manifested more in low income and racially minority populations, and exacerbated by language and cultural barriers. In addition, pre-kindergarteners have had limited involvement with STEM, as most of the innovation efforts have focused more on K-12 population. This project involved the parents in the introduction of bilingual [English & Spanish] Math and Science hands-on activities to the Head Start children in Jerome County through a three-day summer camp. Entailed in this process were the identification and development of appropriate, practical, and relatable hands-on activities; consultation in the organization of the camp; and collaboration with Jerome's Head Start teachers and high school students in the delivery of hands-on activities to the 3 to 5-year old children. The project's underlying argument was that the introduction of math and science concepts at a preschool age enables school-age children, as well as community members, to view science and math as an integral part of their natural lives, rather than the seemingly complex subjects and prerogative field of studies that conflict with beliefs and values.

Assessment was done through direct observation, collaborator and parent surveys, and external assessment to discern children's engagement and interest in the hands-on activities, effectiveness of the delivery methods and materials, parents' involvement, and the general camp performance. Children preferred, were engaged, and showed interest in hands-on activities that were familiar and are an integral part of their daily lives, emphasizing the need to introduce science and math at an early age before science fear and mistrust crystalize and fossilize.

The oral presentation will be about the entire experience.

F. Engineering Pathways for Latino Students

Diana Garza, Advising & Outreach Director, Boise State University; Leandra Aburusa-Lete, Student Success Coordinator, Boise State College of Engineering

The Engineering profession has not attracted a statistically significant number of women and underrepresented minorities. Boise State has responded by targeting Latino students, matching them with college mentors and showcasing STEM opportunities. Two programs have been created to reach out to Latino students and introduce them to the creativity and un-limitless potential engineering can provide. Reaching Latino students as early as eighth grade is important and can shape their academic focus in high school. Students focus on the following concepts 1) Engineers help the world; 2) Engineers think creatively; 3) Engineers enjoy working with other people; and 4) Engineers earn a good living. Join the presenters in hearing more about eDAY, a one day camp and eCAMP a two day camp, both targeting Latino students. Participants will hear more about our marketing plan, program details and transportation focus.

G. Best Practices for Outreach and Engagement to Latino Audiences using Community-Based Programs

Liliana Vega, Ada County Extension Educator, University of Idaho;
Barbara Brody, Malheur County Extension Agent, Oregon State University

Latinos have become the "majority minority" and by 2043 minorities will be the majority in the U.S. with Latinos being the largest ethnic minority group. The lack of targeted programming to ethnically diverse audiences is a growing concern for many organizations and the STEM field. To address this need in Southeastern Oregon and Southwestern Idaho Community-based STEM programs were implemented with Latino youth and their families. The overall goal of both programs is to provide on-going hands-on STEM education to the Latino community. Workshop will provide examples of how Extension has engaged the Latino community, particularly, Latino youth, in STEM education using community-based programs. The key components incorporated in community-based programs are supported by research and include practical examples of how extension educators, staff, and other professionals can expand outreach efforts to Latinos using STEM education. This workshop is relevant to the personal development of professionals and volunteers because the Latino population has been growing at a rapid rate and is expected to continue to grow. It is critical to provide access, equity and opportunities so that all youth have a chance to succeed and have access to STEM education opportunities. The workshop will introduce and discuss the valuable key components to take into consideration when providing educational services to the Latino Community, what the research indicates, and offer practical applications for Faculty, staff, and volunteers to expand outreach and engagement to the Latino population. It is essential professionals and volunteers use best practices when reaching and delivering programs to Latino audiences in ways that are culturally appropriate and meaningful to the Latino community. This workshop will offer practical strategies when programming to Latino audiences. Workshop participants will engage in practical examples and scenarios that will allow them to practice the key components covered throughout the workshop. Take home materials will include a list of practical strategies and applications for engaging with the Latino population. Participants will have a better understanding and real-world examples to improve outreach and engagement to the Latino audiences.

H. Boise State University LSAMP

Emily Flores, LSAMP Coordinator, Boise State University

The purpose of the Louis Stokes Alliance for Minority Participation (LSAMP) is to increase the recruitment, retention, and graduation rate of underrepresented minority students (URM) in the disciplines of Science, Technology, Engineering, and Mathematics (STEM).
The three main goals for the program are:
To increase pathways to college for underrepresented minority students while strengthening their interest in pursuing STEM careers;
Create a culture and community of success for underrepresented minority STEM majors on four-year college campuses to improve retention and graduation rates; and
Expand opportunities for underrepresented minority STEM majors to participate in campus-based and national undergraduate research experiences.
(LSAMP) is dedicated to increasing the quality and quantity of traditionally underrepresented students successfully completing science, technology, engineering and mathematics baccalaureate degree programs. At the same time, LSAMP is working to increase the number of students interested in and qualified for graduate level studies.
The LSAMP program at Boise State University seeks to integrate students into the academic life of their institution and into their chosen discipline in a way that will foster growth and success. Students are provided with academic, social, and professional support in a coordinated effort to help them achieve their academic and professional goals.
Other institutions that are part of the Pacific Northwest LSAMP alliance include Boise State University, Oregon State University, Portland State University, University of Washington, Washington State University, Chemeketa Community College (OR), College of Western Idaho,

Highline Community College (WA), Linn-Benton Community College (OR), Seattle Central Community College, and Yakima Valley Community College (WA).
Although this program is designed for URM students, the focus of the presentation will discuss how the program has impacted Latino/Hispanic students in STEM. The presentation will highlight data from activities, research experience and building community.

I. "How I do STEM" – Community STEM Career Videos

S Kirsten LaPaglia, STEM Access Upward Bound, University of Idaho; John Anderson, Virtual Technology and Design, University of Idaho; Janel Kerr*, State of Idaho, Division of Professional Technical Education

This project brings high school students together with STEM professionals in their local community to create short documentary videos about STEM careers and what it takes to follow those career paths. The production and use of the videos directly addresses the Lewiston-specific need for increased awareness on the path to college, the Idaho-wide need to increase awareness for higher performance in math and science in relation to STEM college and career goals, and Idaho need for positive attitudes and trust toward scientists.
High school students use technology to edit and publish videos while learning about STEM careers in their community. The videos highlight how professionals use STEM in their careers and gives recommendations for steps to get there, such as high school course selection and financial guidance. The process of producing their own videos encourages students to link the math and science curriculum they are learning in high school to potential future careers, which may or may not be traditionally thought of as STEM careers. A website platform allows for these videos to be submitted. The videos are displayed on YouTube and other sites for public use.
Focus groups and surveys were used in this study as follow-up measure to identify perceptions and knowledge of STEM careers in the participating high school students as well as skills and steps necessary to enter and succeed in those career fields. An overview of the instruction and support provided in creating the video segments, guidelines for participation, and rating criteria will be outlined. Focus group and survey information from project participants detailing the impacts of participation will be provided. An invitation to submit videos will also be given with specific information on how, where and what to submit.
Participating high school students were part of the STEM Access Upward Bound program. The program is a federally funded TRIO program that works with students in the Lewis-Clark Valley throughout high school to prepare them for college and postsecondary careers in STEM. The project serves students from low-income, first generation college backgrounds. Services include an experiential STEM-focused six-week summer program-which included this video project, academic year STEM workshops and college field trips, as well as one-on-one in school guidance and tutoring. The Micron Foundation as part of the STEM Education Research Initiative of the University of Idaho provided funding for this video project.

J. Integrated Place-Based STEM: Local Context for STEM Career Awareness and Skill Development

Anne Seifert, Idaho National Laboratory; Louis S. Nadelson, Education, Boise State University

Learning and teaching STEM is more effective and more purposeful when local STEM contexts are leveraged for teaching STEM content and raising student's awareness of STEM careers in their own communities. Through hands-on, minds-on activities, we will explore and demonstrate how our research can be used to enhance STEM curriculum and instruction, raise awareness of STEM career choices and enhance student's desires to pursue STEM fields in your place-based setting.
Business, industry, parks, nature settings, government infrastructure, and professional people, can be invaluable resources for connecting STEM curriculum within context which results in conditions ideal for promoting purposeful learning of authentic STEM content. Community-based STEM resources offer the ideal context for teaching STEM content, providing local resources that engage educators and students, raising awareness of career opportunities and needed STEM skill sets.
Many benefits of focusing teacher attention on these contextual, content aligned resources bring value to educator professional development; including local resources in every community, making

place-based STEM education a possibility regardless of the location of STEM teaching and learning, enabling teachers to identify and champion STEM careers, and offering dreams and possibilities for students to enter STEM fields. Further, associating STEM teaching and learning with local resources addresses issue of workforce development and the STEM pipeline by exposing students to STEM careers and applications in their local communities. In our session we will provide you with the tools and knowledge to explore and identify the local STEM resources in your community, examples of hands on activities enhancing STEM career awareness, how you can use these resources to enhance STEM teaching and learning, and proven methods to enhance teacher STEM Literacy, competence and confidence in teaching STEM subjects in an effort to better prepare students for the STEM workforce.

K. Why Am I an Engineer: A Comparison of Data from Undergraduate Engineering Majors and Professional Engineers

Louis S. Nadelson, Education, Boise State University; Janine Rush-Byers, Micron Foundation; Dee Mooney; Micron Foundation

According to a recent report, K-12 students tend to like mathematics and science. Further, in a survey of desirable STEM careers the students selected engineering with very high frequency which was matched only by nursing in terms of student selection as a desirable STEM career. Yet, when the K-12 students were asked if they would like to work in a career that applies mathematics and science a minority of the students responded "no" indicating that there is a disconnect between their career preferences, expectations, aspirations, and their understanding of engineering as a career. These results led us to wonder what influences an individual to pursue a career in engineering.

We hypothesized that individuals become engineers because they like to work on problems and develop solutions. We posit even though engineering involves substantial application of math and science the primary goal is to identify and work on authentic problems and develop meaningful solutions which overshadows the focus on the application of math and science. Further, we speculate that success in engineering requires the application of multiple other skills Using the report as a reference we developed a survey which included a combination of selected and free response items. We distributed the survey to the undergraduate engineering students at multiple institutions in the United States and to engineering professionals. We began by asking the participants to share why they were drawn to engineering in a free response question. Specifically we sought evidence to determine who influenced the participants' choice of engineering as a major or careers, their motivation for pursuing engineering, how much they like math and science, and how well they do at math and science. We also sought to determine what they like or do not like about math and science.

Our analysis of over 2,500 completed surveys revealed substantial alignment between the responses of the undergraduate engineering majors and the engineering professionals. Our participants were most interested in being engineers to solve problems, because they like math and science, were greatly influenced by others to be an engineer, and had above average success with mathematics and science with an alignment with their liking for math and science. About 80 percent know someone outside of school or work who is an engineer, and about 40 percent had engaged in out of school activities that are associated with engineering. Implications and recommendations for future research are shared.

L. ONEIdaho: How Idaho's Experimental Program to Stimulate Competitive Research (EPSCoR) is Bridging the Gap Between the Classroom and Careers in STEM Research

Lee Vierling, Natural Resources, University of Idaho; Karla Eitel, McCall Outdoor Science School, University of Idaho; Shawn Benner*, Cindy Busche*; Carie Green*; Jairo Hernandez*; Eric Lindquist*; David Makings*; Brant Miller*; Sarah Penney*; Rosemary Smith*; Mark Solomon*

Idaho's Experimental Program for Competitive Research (EPSCoR) is a new, 5-year, $20M National Science Foundation sponsored program designed to build the STEM research infrastructure in the state. A major part of Idaho EPSCoR is to create outreach, education, and workforce development

opportunities in order to link the citizens of Idaho with cutting edge research occurring across the state.

Idaho EPSCoR is creating a series of programs to engage high school teachers and students with undergraduate and graduate students and faculty at 2- and 4-year colleges and universities across Idaho. These efforts focus upon the science theme of better understanding, through the lens of both the social and natural sciences, how Idaho's changing landscapes will affect ecosystem services (such as food production, clean and ample water, and pollination of crops) upon which Idaho's citizens depend.

We will present and discuss the innovative components of Idaho EPSCoR's outreach and workforce development efforts. These include 1) Adventure Learning, a program that connects high school teachers face-to-face and online with university faculty across the state to get hands-on experience in studying ecosystem services, 2) an extensive undergraduate research program that pairs college students with faculty and stakeholders to conduct primary STEM research, and 3) an "ambassador" program aimed at connecting the state's 2- and 4- year college faculty and students with high quality research being done at Idaho State University, Boise State University, and the University of Idaho. We invite you to join us in learning about how you can become engaged in these exciting initiatives aimed at increasing the opportunities of Idaho's youth to be connected to hands-on research occurring across the state.

M. Parents Press Play for Practices

Julie Amador, Curriculum & Instruction, University of Idaho

Recent trends in mathematics education have called for promoting depth of knowledge as opposed to shallow coverage of mathematics content (Shield & Dole, 2012). In 2010, the Common Core State Standards for Mathematics were released on a national level with the purpose of providing a "more focused and coherent" set of standards for mathematics (CCSSM, 2010, p. 3). Currently, school districts both across Idaho and around the country are working to begin implementing the Common Core State Standards for Mathematics, with full implementation expected by the year 2014. During this implementation phase, educators, parents, and community members should be aware of the change and know how to best support student learning.

With these new standards, recent survey findings indicate parents in Kootenai County, Idaho, occasionally have a difficult time helping their children with mathematics homework (Storrs, Hormel, & Mihelich, 2012). At the same time, they find themselves feeling that they do not have enough time to be involved in the education of their children. As a result, a project was designed and implemented to provide support to parents of students in grades K-6 through familiarization with the Standards of Mathematical Practice in the Common Core State Standards for Mathematics. The intent was that with increased knowledge about the Standards for Mathematical Practice parents would increase their confidence to help their children with mathematics homework. Specifically, the project focused on two mathematical practices: 1) Problem Solving: "Make sense of problems and persevere in solving them," and 2) Models in Mathematics: "Model with mathematics" (CCSSM, 2010, p. 7). Both mathematical practices are pertinent for helping students in grades K-6 succeed. An online video tutorial program was designed and implemented to provide parents with convenient access to information about how to help their children. Findings from the study indicate that the video tutorial supported parents in understanding how to assist their children with learning mathematics. Additionally, parents found the online video format to be advantageous, as compared with attending an in-person class.

This session will include information about 1) the creation and deployment of the online video tutorial, and 2) research findings supporting the use of this method for reaching parents and helping them support their children as they learn mathematics. Audience members will leave the session understanding how parents learned about the mathematical practices by pressing play.

N. Parental Influence on STEM: The 95 Percent Solution

Jim Schmidt, PCS Edventures, Inc.

Research has shown that the majority of what U.S. citizens learn and know about science doesn't come from schools. In the November 2010 issue of American Scientist, a feature article titled "The

95 Percent Solution" discussed the fact that alternative places for learning, such as museums, aquariums, and other sources are far more influential on the public understanding of science. This presentation examines the significant impact of informal and non-formal science education in the United States. We will also introduce the local PCS EdventuresLab program, which publishes a blog detailing activities done in the lab and includes specific extensions for specific projects which students may engage in at home. We will provide a brief introduction to the PCS Cortex v5 software program, the first tablet based robotics program which students may use at home and while traveling.

O. Parents have STEM Power

Amy Christopherson, Director, Mini-Cassia Center, College of Southern Idaho

When our elementary school lost funding for 5th grade field trips, we decided to bring the field trip experience to their backyard playground. We have organized three consecutive STEM Days at Declo Elementary in the Cassia School District, and each time it provides a full day of interactive classes taught by parents who have occupations or hobbies in a variety of STEM fields. Over the years, we have covered chemistry, physics, botany, robotics, ecology, engineering, and so much more in creative and hands-on ways. As I have planned these events, I have found qualified and passionate parents that are very excited to participate. They just needed to be asked and given a set of expectations to be successful. Identifying new ways to present STEM topics has also given parents without a professional background the flexibility to be included.

This rural school is typical of many of the schools in Idaho. We have parents that are professionals, but just as many parents work as farmers, laborers, and homemakers. I have been successful at developing a STEM program at this school as a parent volunteer because I have taken talented people from all backgrounds and made a connection between their hobbies and STEM fields. As parents recognize the connections that already exist, they find creative ways to teach relevant applications to the students, especially to their own children.

I would like to present this model for a STEM activity at this particular conference. I will also include other ways that I engage parents at school activities that are already scheduled, like Math and Reading nights, and of course, Science Fairs. Parents are like the rest of us with limited time and resources. If we can build bridges between traditional school activities and strategically planned STEM experiences, then we maximize the exposure to STEM in a relaxed environment.

I would like to make the assertion that this type of STEM Day event, as well as Science Fair projects, Math nights with Engineering activities, and other specific STEM events, directly impacts parental attitudes towards these areas. Parents are more informed about how their kids' interests relate to future classes and careers. As we transition to a new model of Common Core standards and SBAC testing processes, all of us have the opportunity to introduce enhanced school activities that would support these changes, and our students will benefit as a result.

Cultivating self-efficacy and relationship through 4-H WeDo Robotics.

P. Cultivating Self-efficacy and Relationships through 4-H WeDo Robotics

Will Boyd, 4-H Extension Science Associate, University of Idaho; Tim Ewers, 4-H Youth Development Specialist, STEM Education, University of Idaho

Recent research suggests parents face a quagmire of uncertainty as they attempt to prepare their children for post K-12 education. These same parents wish to be more involved in their children's education leading up to this transition, yet they often lack the critical math and science skills they know to be necessary for their children to be successful. Engaging early on with their children in math and science programs can lay a foundation which may help parents to cultivate a "learning as a family" culture, and provide a mechanism for the post K-12 transition to be made on firmer ground.

Idaho Robotics Opportunities for K-12 Students (Idaho ROKS™), a University of Idaho Extension/4-H program, has developed an extensive compilation (50+ hours) of educational activities and lessons for the LEGO WeDo Robotics system, designed by LEGO Education for children ages 5-10 years old. Idaho ROKS staff provide WeDo professional development trainings to educators throughout the state and serve as the primary catalyst for the growth and popularity this program has seen in

Idaho. The WeDo construction set consists of LEGO with electronic components which interfaces with a computer to make, programmable, interactive LEGO creations.
4-H WeDo Robotics:
Provides opportunity for fun and authentic STEM experiences
Makes mechanical processes and concepts easy to visualize and provides opportunity to use and practice physics and engineering vocabulary.
Equips parents with an open-ended ongoing STEM learning system that they can explore and participate in side by side with their child(ren)*
Encourages creative expression and learning by playing.
Outcomes: Through participation in a WeDo professional development training and accompanying class or workshop
Parents develop a better understanding of physical science concepts and accompanying science and engineering vocabulary, increasing self-efficacy in STEM education.
Parents cultivate a "learning together as a family" culture
Parents develop a better understanding of basic computer programming concepts
*Idaho ROKS offers a suite of K12 Educational Robotics programs so when children and parents outgrow WeDo they may continue their educational journey together. For more visit http//www.uidaho.edu/extension/robotics/4h

Q. "It's NOT Working": Women in Engineering and Computer Science
Amy Moll, Dean of the College of Engineering, Boise State University
Since the mid-80's the percentage of women pursuing undergraduate degrees in engineering and computer science has been flat or declining. In addition, although women are nearly 50% of the professional workforce, they constitute less than 15% of the working engineers in the United States. Women leave these fields in higher numbers than men resulting in a continued gender gap throughout all levels of employment.
Efforts in creating outreach activities, special events and camps for girls are not having the far-reaching effect that is needed. After reviewing current data and research on women in engineering and computer science, different types of outreach efforts from across the nation will be highlighted. Societal pressures and ways to counteract them will also be discussed. Part of this session will include a guided brainstorming session to develop an action plan for Idaho to fundamentally shift the interest of girls in engineering and computer science fields.

R. Changing Perceptions…One Girl at a Time
Diana Garza, Advising & Outreach Director, Boise State University; Leandra Aburusa-Lete, Student Success Coordinator, Boise State College of Engineering
Engineers can do anything. They are creative problem solvers and rely on their math and science skills to improve a consumer need. Girls can use their creativity and apply it to an engineering challenge and help improve lives. Celebrating ten years this summer, Boise State has been hosting girls and inviting them to eGirls, a two day overnight camp. Learning modules include, The Biomechanics of High Heels, The Physics of Rock Climbing, Packaging and the Environment, and other topics. Students focus on the following concepts 1) Engineers help the world; 2) Engineers think creatively; 3) Engineers enjoy working with other people; and 4) Engineers earn a good living. Join in the conversation and share your ideas and success stories.

S. Digital Innovation Generating New Information Technology
Julie Amador, Curriculum & Instruction, University of Idaho; Terence Soule, Computer Science, University of Idaho
Recent survey findings reported students in Idaho are interested in jobs in STEM fields, including engineering and technology; however, between seventh and tenth grade, girls' positive attitudes toward mathematics and science drastically declined and their interest in careers involving mathematics and science decreased drastically as well (Idaho, 2013). Findings report that girls' attitudes "diminished at a far more substantial rate than for boys," highlighting the need to focus on girls and STEM disciplines (Idaho, 2013, p. 26).

The Digital Innovation Generating New Information Technology (Dig'n IT) program was a two part project aimed at increasing digital literacies and promoting technological careers for middle and high school girls. The high school component, termed "Dig'n IT Interns", brought together five high school girls for a summer internship experience focused on technology. Specifically, through the internship program, the girls became familiar with technologically related careers, local start-up companies focused on technology, and engaged in specific uses of technology such as computer coding and programming. For the middle school component, "Dig'n IT Camp", twenty-seven middle school girls came together for an intensive week focused on computer coding, hardware and software use, and digital literacies. These middle school girls worked collaboratively with computer science faculty as they created their own computer games by writing computer code. They published their games to a website (http://www2.cs.uidaho.edu/~tsoule/codecamppages/) and displayed their work at a culminating showcase celebration, uniting family members, educators, community personnel, local business and technology experts.
In this session, we share experiences from the high school and middle school components of this program. Specifically, we will address 1) implementation of the two programs and 2) computer coding with girls. We will describe the implemented programs in detail, with an emphasis on helping others understand the process and connection to mathematics and science. We will emphasize how the program was structured to promote learning for the participants. Audience members will engage in the presentation by viewing some of the coding projects and by participating in a discussion about the project.

T. Assessing Professional Identity of STEM Majors

Louis S. Nadelson, Kimberly McAdams, Sharon McGuire*, Arvin Farid*, Kirsten Davis*, Raj Nagarajan*, Sasha Wang*, Uwe Kaiser*, Yu-Chang Hsu*

Post-secondary education is expected to substantially contribute to the cognitive growth and professional achievement of STEM students. Yet, there is limited understanding of how STEM students develop professionally. We used the lens of self-authorship (Baxter Magolda, 1998) to develop an instrument to be used for large-scale assessment of STEM student professional identity development. Through the process of instrument development, we assessed the relationship between the level of STEM students' perceptions of their professional identities and their educational experiences, learning preferences, and interaction with faculty comfort. Our results indicate that several proxy questions may be useful for assessing STEM student professional identity development. We also found a misalignment between students' perception of themselves as professionals and the expectations for their actions in professional situations. We provide implications for our research and directions for on-going investigations.

U. Idaho ROKS: A K-12 Series of Programs in which Youth and Adult Mentors Experience Science and Engineering Through Robotics.

Tim Ewers, 4-H Youth Development Specialist, STEM Education, University of Idaho; Will Boyd, 4-H Extension Science Associate, University of Idaho

The Idaho Robotics Opportunities for K-12 Students (Idaho ROKS™) is a University of Idaho College of Agricultural & Life Science 4-H Extension Education system of programs. Idaho ROKS™, started in 2006, promotes, supports, and manages a K-12 continuum of pre-collegiate programs designed to educate and inspire youth in science, technology, engineering, and mathematics (STEM) awareness, interest, competence, and opportunities.
Through Idaho ROKS activities, youth use robotics to develop not only computer literacy skills but also technological fluency. They employ technologies to work through and explore math and physical concepts. They develop computational thinking skills. They learn and use engineering design. They express themselves creatively. They learn and practice many of the 21st Century Skills needed for their success. Through educational robotics activities youth explore real-world issues, learn how science helps develop better understanding of natural phenomena, and how engineering is used to solve problems important to humans.
This presentation will provide an overview of the six main divisions of Idaho ROKS programming including: WeDo Robotics (ages 5-10), Jr. FIRST LEGO League (ages 6-9), 4-H Platform Robotics

(ages 8-18), 4-H Junk Drawer Robotics (ages 8-18), FIRST LEGO League (ages 9-14), and FIRST Tech Challenge (ages 12-18). The program overview will include, for each division, a brief description of the program including educational foundation and learning objectives, and extent of the program in Idaho. The presentation will also cite literature indicating the benefits of these programs improving youth awareness and interest in pursuing STEM careers.

V. Promotion of Educational Opportunities and STEM Career Pathways: Lessons Learned in Designing an Awareness Campaign

Jessica Sotelo, Executive Director, Partners for Prosperity; Chris Guthrie, Workforce Development Specialist, Partners for Prosperity

In 2013, Partners for Prosperity (P4P) embarked on a pilot project to create a public awareness campaign about professional technical education (PTE) with a particular emphasis on STEM career pathways. P4P is a nonprofit organization dedicated to poverty reduction by building assets through education, workforce development and financial literacy.

The Innovation Grant project included two parts: first, to create awareness about financial aid, college applications, and most importantly about PTE and STEM career pathways; second, to work with three area high schools to provide a hands on workshop for assistance with college applications, FAFSA, and information about PTE and STEM career pathways.

The plan was to utilize existing promotional materials as a basis to launch the campaign and to partner with the regional colleges for the high school visits. The project hit a series of "road blocks" that may help inform the disconnect between students/parents and awareness of educational opportunities and processes.

First, P4P was unable to identify an organization or government entity that has already created informational/marketing materials that provide this type of information including promoting PTE and general STEM career pathways. Materials exist promoting individual colleges and programs but not the general educational option of PTE and STEM career pathways. In addition, the way in which the Idaho Department of Education, local high schools and colleges conduct high school student outreach and information sessions is not conducive to the type of workshop we initially envisioned. Currently students receive release time to attend presentations from two colleges of their choice. The issue here is that this type of event presumes students have decided to attend college and know about the differences and opportunities for both professional technical education and academic education. The only question is which school they choose. Our intent was to give students additional information about PTE and STEM so they can make a more informed decision.

To date a poster and PSA/commercial have been created and distributed that promotes STEM and educational opportunities. However changes have been made to the second part of the innovation project—the workshops. Instead of conducting workshops at area high schools, P4P made a mid-course correction to provide "booklets" of information on college applications, FAFSAs, STEM career pathways, etc. to six area high schools for their graduating senior classes. Instead of reaching only those students who attend a workshop, information will now be distributed to over 1,000 high school seniors.

In summary, we anticipate the findings from this project to answer some of the questions raised by the Micron Foundation research related to student and parent awareness related to college applications and educational processes.

W. Creating a Regional Workforce for Rural Manufacturing: Linking Technical Education Systems and Students to Local Business

Raymond Dixon, College of Education, University of Idaho

North Central Idaho workforce is growing slowly and notably older than the rest of the state or nation. Between 1978 and 2008, the region's civilian labor force grew 11.8 percent from 43,200 to 48,300. In the same 30- year period, the U.S. civilian labor force grew 50.9 percent and Idaho's grew 82.7 percent. In 2008, 17.9 percent of the U.S. labor force was over 54 years of age, 19.2 percent of the region's labor force was in this age category. These statistics indicate the region will be facing a high number of retirements in the coming years. With a slowly growing regional

youth population, the region will face further challenges replacing retirees unless graduates can be attracted to the manufacturing industry and remained in the region. NIMA's needs assessment survey also identified a negative perception amongst local school district administrators, youths, parents, and teachers regarding the potential for rewarding and livable wage jobs in the manufacturing sector. Because of this negative perception, manufacturing often is not promoted as a quality career possibility and some school district personnel were completely unaware of job opportunities in regional manufacturing.

The NSF ATE program "Creating a Regional Workforce for Rural Manufacturing" commenced in August 2011. It is a collaborative effort between educational institutions, Lewis Clark State College (LCSC) and the University of Idaho (UI); economic development association, Clearwater Economic Development Association (CEDA) and Valley Vision economic Development Association; and manufacturing association, Northwest Intermountain Manufacturing Association (NIMA). Major goals of this project are: 1) Pilot the integration of a common manufacturing solid modeling Computer Aided Drafting and Designing (CADD) tool into high-school technical and STEM courses, 2) Provide professional development for high-school STEM teachers in the use of solid modeling CADD tools to integrate STEM concepts and 3) Develop a mentoring program between local manufacturers and local high-schools to provide teachers with support and practical technical skill development activities for students.

Now in its third year this program have provided CADD and STEM reflective resources for teachers and students; held professional development workshops for math, science, and technology education teachers in the use of SolidWorks® CADD software, instructional resources, and STEM reflective guides; align mentors from manufacturing companies such as Schweitzer Engineering Laboratories, Gem Chain Bar, Hillco, and Hydraulic Wrench, with some schools; and started a workforce development council. It is hoped that this collaborative model for workforce development can be replicated in regions with similar demography and workforce challenges.

X. Research Experience for Undergraduates (REU) Programs at Boise State University and Their Initiatives To Generate Interest in STEM Fields

Liljana Babinkostova, Department of Mathematics, Boise State University

Since 2011 the Department of Mathematics at Boise State University hosts a summer research program for undergraduates, "Complexity Across Disciplines (CAD)". The program is funded by the National Science Foundation (NSF) and Boise State University. The program in a nine-week summer program in which undergraduate students experience independent research in mathematics motivated by applications to information security or the life sciences. The nature of computing and complexity is the central unifying focus of the program. Each year the program engages up to 10 students in our mathematics-based interdisciplinary research.

To achieve broad representation in our program we recruit nationwide. The recruitment tools include e-blasting, direct contact with universities and colleges, advertising at the Mathematical Association of America (MAA) and American Math Society (AMS) websites, conferences as well as through our REU alumni. On average we receive around 250 applications per summer program. Applications are submitted online at the math programs portal maintained by the AMS.

The acceptance into the program is based on the students' potential and academic ability in science and engineering, demonstration of an interest in conducting independent research based on letters of recommendation and a personal interview.

The program also engages the REU students and faculty mentors in outreach activities with the general public and K-12 students and teachers. The activities includes workshops on cryptography and number theory to the high school students from the Idaho Science and Aerospace Scholars (ISAS) program, and a computational workshop for K-12 teachers. Starting this year our REU program organizes several professional development workshops for K-12 teachers and students in collaboration with other programs at Boise State University. The teachers sign up for these workshops through the Concurrent Enrollment Program at Boise State University. In this talk we will present the structure of our program and the ongoing activities that we are providing to raise students' interest in STEM fields.

Y. Engineering and Technology Education 2+2 Program to Bring STEM Career Awareness to Idaho students

Dave Campbell, University of Idaho - Twin Falls; Raymond Dixon, Education, University of Idaho; John Cannon, University of Idaho - Boise; Terry Patterson, College of Southern Idaho

President Obama has called on the nation to develop, recruit, and retain 100,000 excellent STEM teachers over the next 10 years. He also has asked colleges and universities to graduate an additional 1 million students with STEM majors. The University of Idaho (UI) is collaborating with the College of Southern Idaho (CSI) in a 2+2 Engineering and Technology Education (eTE) program, to produce teachers who naturally integrate all aspects of STEM in the classroom. This 2+2 program melds CSI's state of the art equipment and facilities, with UI's comprehensive curriculum for integrative STEM pedagogy.

Engineering and technology teachers encourage students to enter engineering or technology career fields through a curriculum of technology and pre-engineering courses. Curriculums, such as Project Lead the Way, Engineering by Design, STEM & CAD Academy, PCS Education, and courses on specific career clusters, not only require STEM competency (and pedagogy) but also require teachers that have the necessary technical skills to teach PTE programs in schools with variant facilities. The 2+2 program addresses this and produces teachers that help students explore engineering and technology career opportunities through a variety of hands-on experiences.

Graduates teach to the Idaho Technology Education standards, Common Core, AAAS Benchmarks for Science and the NCTM Benchmarks for Mathematics. They are now mapping the curriculums to the Next Generation of Science Standards which includes engineering concepts. The teachers address the nature of technology, technology and society, engineering design, and problem solving. They ensure that students are introduced to the worlds of; medical, biotech, agricultural, energy and power, communications, transportation, manufacturing, and construction technologies.

The engineering design process integrates STEM concepts to solve complex real-world problems. eTE teachers use this process to teach problem solving skills. Scientific inquiry and mathematical modeling are brought into the process as tools to complete the analysis and optimization stage of the design process. eTE teachers are exposed to pedagogies to integrate the process and use it to solve problems. CSI's advanced technical facilities allow the eTE teachers to develop the hands-on technical skills needed to function effectively in the variant technology education classrooms throughout Idaho.

Call to action: First, encourage schools to obtain or to better support their Technology Education/Pre-Engineering program (K-12). Second, help identify and recruit eTE teachers. We need 12-18 teacher candidates per year. Finally, encourage the integration of your school(s) Science, Technology education/pre-Engineering, and Math programs to capitalize their synergistic strengths.

Z. Hitachi STEM Outreach Programs and CTEq Participation

Robert Gordon, Sr Exec Distribution Network Development, Hitachi High Tech America; Mike Toalson, Western Analytical Solutions, LLC, representative for Hitachi

This presentation will review several primary topics related to Hitachi's participation in STEM Outreach and Change the Equation:

Resources available to educators from Hitachi High Technologies America via the dedicated STEM website www.inspireSTEMeducation.us which provides information, lesson plans, teaching tools, and more to enlighten students about the hidden world of the Nano-scale.

Potential careers where this type of knowledge and technology is important.

Outreach Activities by Hitachi for assisted hands-on utilization of a table-top Scanning Electron Microscope by students and teachers.

Success Stories of School Districts and Universities that have acquired their own SEM for use in both stationary and mobile STEM education programs.

AA. Lakeland School District iSTEM from Excellence

Jim Ekins, University of Idaho; Sarah Halsted, Lakeland School District

Lakeland School District and University of Idaho Extension Water Education program successfully submitted a Micron STEM Education Research Initiative Pilot Project proposal. The project entails four prongs: professional teacher development and sustained job-embedded support in NextGen- and CC- tied STEM content and inquiry-based learning pedagogies; after school programming for 4-6th grade students; development of online parent resources; and developing a support network with STEM professionals as a form of community-wide STEM education. Research is designed to assess whether the content and skills are retained by teachers over time, and to capture teachers' attitudes and confidence levels regarding NextGen standards, CC ELA and math standards.

The end goal is to increase student capability and desire to complete STEM degrees or certifications and to become engaged thinkers, invested citizens and holistic problem solvers. The parent support provided on the student/parent website engages them with links to animations, videos, interactive websites, and content taught in-class, so that parents are co-learners with their students.

Longitudinal survey design consists of four survey instruments. First is identical to Micron parent survey given to district parents; second survey given anonymously to all K-12 teachers District-wide; third online survey was given anonymously to 3rd – 6th grade teachers District-wide; fourth survey given only to iSTEM professional development course participants as pre-, post-, and dual delayed-post content retention tests. Parents are re-surveyed at years end, to capture changes in attitudes about STEM ed. Preliminary data analysis indicates an average of 41% increase in teacher content knowledge (range = 21 - 60% increase) in cohort teachers as assessed in the teacher cohort assessment survey. Parent surveys indicate strong initial approval of the program and desire for their student to complete a college/post-graduate degree.

Next steps include continued program operation and completion of survey series and student, parent, and teacher assessments of the program. Two NSF grants were written (DRK-12 and AISL) to continue the program into the next 3-5 years. Expansion plans into the Coeur d'Alene School District's Fernan Elementary are under way. An iSTEM Summer Institute Strand is planned for Coeur d'Alene for Summer 2014, under the heading "A Walk in the Watershed" based on the fourth grade thematic arc developed for iSTEM from Excellence.

BB. Young Children at Play: How Parents Can Facilitate Early Math and Science Learning as Their Children Play

Harriet Shaklee, University of Idaho Extension

Beginning at birth, children construct knowledge through their senses and their experiences in the world around them. Lev Vygotsky, a Russian psychologist, believed that children stretch beyond their own understanding through activities while at play, developing new skills for further learning. Recent research shows the investigative and problem solving skills young children show in a play environment (e.g. Schulz & Bonawitz, 2007).

Children's math and science learning begins in the earliest years of life. Through the various stages of development, children at play begin to learn essential math skills such as counting, equality, addition and subtraction, estimation, planning, patterns, classification, volume and area, and measurement. Children also cultivate reasoning skills in the context of play, posing and testing hypotheses as they solve problems. Children's informal understanding provides a foundation on which formal concepts can be built.

Parents can facilitate this learning by offering infants, toddlers and preschoolers opportunities and materials to promote their construction of science and math concepts. Research shows a variety of approaches parents take in supporting their young children's development in the domains of both science and math (e.g. Tenenbaum & Callanan, 2008). Just as children need to hear language, rhymes and sounds for early literacy, they need experience to develop problem solving skills and number sense. Children who are surrounded with interesting objects such as blocks, are naturally led to discover relationships among them–for example, same and different, small and large, and more and less. The more frequently children make comparisons, the more complex their comparisons become. Parent, teacher or peer dialogue describing, naming and asking

questions provides the words, the symbols and grasp of quantity that builds mathematical thinking.
As parents become aware of emergent math and science processes, they can develop rich learning environments for their children at home. Block play is used as an example of a play activity replete with opportunities for development of early math and science concepts. This presentation will focus on ways to draw parent attention to these processes, and engage them in supporting their children's development.

CC. Science Education Obstacles and the Emergent Nature of Culture
Jon Bender, Mechanical and Biomedical Engineering, Boise State University
Developing STEM proficiency requires establishing a mode of operation that supports effective question and conclusion generation - "critical inquiry." This is more of a paradigm than a procedure, and as such, a great place to begin developing this approach is at the community level. The communities whose students are most scientifically proficient are those for whom scientific values are most engrained.
I have taught classes with a scientific process focus, rather than the traditional conclusion emphasis, at the 8th grade, high school, and college levels. I have even conducted an entire physics course without ever providing students with an "answer." While I have produced statistically significant results in nearly every case, the greatest challenge, and greatest successes, have been with 8th graders, whose notions about what is and is not the "correct" way to approach problems have not solidified completely. In every case, but particularly with the 8th graders, I spent almost as much time working with parents as with their kids. Parents' understanding and support of my approach was directly correlated to their children's willingness to endure uncertainty and frustration, as well as their resourcefulness and gains in intellectual independence. I have metacognitive tools, as well as rubrics, assessment formats, etc., some of which have been published, and some of those published have been adopted and modified by various universities and school districts.
In my experience, the first step toward helping parents help their kids is to clearly and transparently define the culture and values you wish to cultivate. These values must be consistently applied to all aspects of the instructional design. It is then essential that educators involve parents with the described culture. Once this is in place, it becomes far less important that parents are familiar with the technical aspects of their students' academics, because the real critical support they can provide is reinforcement in exercising scientific problem-solving strategies. This can be done explicitly, or even simply incorporated into everyday activities, and is not dependent on full knowledge of the eventual conclusions.
Both students and parents alike should be considered and evaluated regarding their level of experience and familiarity with the processes and values applied in all STEM (scientific) disciplines. Once this is established, the educator can then support each parent appropriately (e.g. a very unfamiliar parent could be given specific questions to ask their children about the things that are happening, like "why do you think that rock just broke apart when the other one didn't?" and then "how did you come up with that idea?" and then, "how about we try to figure out if you're right" and so on. An inculturated parent could just be handed a well written rubric and then asked to a brief conference to ensure that they understand).

***additional author not presenting**