### MSSE Program, College of Letters and Science

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
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<tbody>
<tr>
<td>Director</td>
<td>Peggy Taylor</td>
</tr>
<tr>
<td>Associate Director</td>
<td>Diana Paterson</td>
</tr>
<tr>
<td>Lead Program Faculty</td>
<td>John Graves</td>
</tr>
<tr>
<td>Program Officer</td>
<td>Holly Thompson</td>
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### MSSE Faculty Steering Committee

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>John Graves</td>
<td>Science Education</td>
</tr>
<tr>
<td>Steve Holmgren</td>
<td>Chemistry/Biochemistry</td>
</tr>
<tr>
<td>Todd Kaiser</td>
<td>Electrical &amp; Computer Engineering</td>
</tr>
<tr>
<td>Dave Lageson</td>
<td>Earth Sciences</td>
</tr>
<tr>
<td>Karlene Hoo</td>
<td>Graduate School</td>
</tr>
<tr>
<td>Jennifer Luebeck</td>
<td>Mathematics</td>
</tr>
<tr>
<td>Nicholas Lux</td>
<td>Education</td>
</tr>
<tr>
<td>Kim Obbink</td>
<td>Extended University</td>
</tr>
<tr>
<td>Amy Washtak</td>
<td>Bozeman HS, MSSE Graduate</td>
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<tr>
<td>Angela Weikert</td>
<td>Museum of the Rockies, MSSE Graduate</td>
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<td>Walt Woolbaugh</td>
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### Supporting Colleges & Divisions

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<tr>
<td>College of Agriculture</td>
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<td>College of Engineering</td>
<td>Brett Gunnink</td>
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<tr>
<td>College of Education, Health &amp; Human Development</td>
<td>Alison Harmon</td>
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<tr>
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<td>The Graduate School</td>
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### Collaboration Departments

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<tr>
<td>Burns Technology Center</td>
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<tr>
<td>Cell Biology &amp; Neuroscience</td>
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<td>Mary Cloninger</td>
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<td>Civil Engineering</td>
<td>Jerry Stephens</td>
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<td>Mary Hubbard</td>
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<td>Ecology</td>
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<td>Robert Maher</td>
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<td>Health &amp; Human Development</td>
<td>Deborah Haynes</td>
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<td>Land Resources &amp; Environmental Sciences</td>
<td>Tracy Sterling</td>
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<td>Microbiology &amp; Immunology</td>
<td>Mark Jutila</td>
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<tr>
<td>Physics</td>
<td>Yves Idzerda</td>
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<td>Plant Science &amp; Plant Pathology</td>
<td>John Sherwood</td>
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<tr>
<td>Political Science</td>
<td>Linda Young</td>
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In May, 1996, the Montana Board of Regents of Higher Education approved a new degree, the Master of Science Education (MSSE), designed for science educators interested in graduate study while remaining employed. It is unusual in two important ways. First, it is an intercollege, interdisciplinary effort. Four colleges, The Graduate School, and fifteen departments collaborate to offer this innovative degree. Second, about 80% of the courses and credits needed to complete the degree are offered by distance learning in structured interactive courses using asynchronous, computer mediated instruction. The National Teacher Enhancement Network (NTEN) project, a National Science Foundation grant project, funded since 1992, developed and offers many of the distance learning courses for this degree program. While direct oversight of the program was provided by the Graduate School from inception to 2016, the program was moved to the College of Letters and Science July 1, 2016. In addition to completing core courses in education, those seeking the degree develop interdisciplinary combinations of science courses from offerings in biology, chemistry, earth science, ecology, engineering, microbiology, physics, plant science, and other science content areas. All graduates complete a science education capstone project in their final year.

Norm Reed, Coordinator 1996 to 1998, artfully handled admissions for the first two cohorts, oversaw design and development of core classes, and overall implementation of the program. In 1997, 30 teachers enrolled in six classes offered in the first campus summer session. In comparison, this summer, close to 400 teachers are enrolled in approximately 45 campus and distance courses.

Carol Thoresen, Coordinator 1999 to 2007, grew the program from 25 to about 60 students per year. Larger enrollment allowed for a wider variety of science course offerings. Carol worked with leading instructors and researchers to develop over 25 new program courses, some with very innovative modes of delivery.

Peggy Taylor is the current Director of MSSE. She assumed her position in December of 2007. As a graduate of the program’s first cohort, she brings a unique perspective to its administration. Her contributions include expansion of the program’s targeted populations, strengthening the programs framework through continuous evaluation processes, and growing program admissions to close to 100 per year.

Diana Paterson, Associate Director, joined the program in 2002. She provides critical recruiting and advising support to off-campus graduate students. Diana skillfully manages the MSSE office and staff. Students lovingly refer to her as the “glue” that holds them together through challenging times.

John Graves, Lead Program Faculty, has been a core MSSE instructor since 2003. He assumed his duties as Lead Program Faculty in 2009. In addition to his instructional responsibilities, John provides guidance and mentoring for MSSE faculty, participates in various outreach activities, and serves as liaison between MSSE office and MSSE instructors.
MSSE Capstone Project

Each Master of Science in Science Education (MSSE) student, with the cooperation of her or his graduate committee, identifies and completes a science education capstone project. Each project is designed to provide experience and information that aids our understanding of science teaching-learning or science curriculum. The capstone project topic is generally identified during the first year of the student’s graduate program. A student begins the project, which generally relates to science education in the MSSE student’s educational setting, in the fall of the final year by submitting a proposal to his/her advisor. The results of each student’s project are summarized in a written professional paper completed and presented in the student’s final summer session. The MSSE Steering Committee, faculty, and staff congratulate these deserving graduate students for their persistence to pursue a graduate degree, while continuing full-time employment as science educators.
2016 Capstone Project Advisors

Chris Bahn, Chemistry/Biochemistry  
Lisa Brown, Extended University  
Eric Brunsell, Science Education  
Nick Childs, Physics  
Greg Francis, Physics  
Candace Goodman, Chemistry/Biochemistry  
John Graves, Science Education  
Irene Grimberg, Physics, Cell Biology & Neuroscience  
Ron Hellings, Physics  
Steve Holmgren, Chemistry/Biochemistry  
Todd Kaiser, Electrical Engineering  
Amber Kirkpatrick, LRES  
Robyn Klein, Plant Sciences & Plant Pathology  
Daniel Lawver, Earth Sciences  
Nicholas Lux, Education  
Stephanie McGinnis, LRES  
Bill McLaughlin, Chemistry/Biochemistry  
Tom McMahon, Ecology  
Terrill Paterson, Ecology  
Elinor Pulcini, Microbiology & Immunology  
Marci Reuer, Science Education  
Kenneth Taylor, Physics  
Peggy Taylor, Science Education  
Amy Washtak, Chemistry & Biochemistry  
Tad Weaver, Ecology  
Angie Weikert, Museum of the Rockies  
Dave Willey, Ecology  
John Winnie, Ecology  
Walt Woolbaugh, Science Education

Off-Campus Advisors

Kathryn Apley, Kansas University, Manhattan, KS  
Clyde Barlow, Evergreen State College, Olympia, WA  
Ritchie Boyd, Principal Strategist, Enterprise Consulting, Blackboard Inc.  
Joseph Bradshaw, Bozeman High School, Bozeman, MT  
Patricia Brown, Temple University, Philadelphia, PA  
Nancy Burritt, Science Education, Menomonie, WI  
William Gribb, University of Wyoming, Laramie, WY  
Phillip Kaatz, Mesalands Comm. College, Tucumcari, NM  
Gerald Ketterling, Valley City State Univ., Valley City, ND  
Cherie McKeever, MSU-Great Falls  
Louise Mead, Michigan State University, East Lansing, MI  
Ken Miller, MSU-Billings  
Gerald Nelson, Casper College, Casper, WY  
Suzanna Soileau, Outreach Coordinator, USGS Northern Rocky Mtn. Science Ctr., Bozeman, MT  
Gregory Reinemer, Highline Community College DesMoines, WA
## Capstone Presentation Schedule

<table>
<thead>
<tr>
<th>Presenter</th>
<th>Room</th>
<th>Date</th>
<th>Time</th>
<th>Presenter</th>
<th>Room</th>
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<th>Time</th>
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<td>Baron, Shauna</td>
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<td>10 am</td>
<td>Lauterbach, Renee</td>
<td>Reid 452</td>
<td>July 7</td>
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<tr>
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<td>Leavell, Daniel</td>
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<tr>
<td>Bidwell, Tracey</td>
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<td>Levitt, Joseph</td>
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<td>Burgess, Megan</td>
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* Library Room 1151 – Innovative Learning Studio
### Capstone Presentation Schedule (Continued)

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Laura Ouborg (outside capstone week)
Tuesday July 5, 2016

Orientation  Joseph P. Levitt, Newton, NH
The Governor’s Academy, Byfield, MA
Facilitator: Andrew Friedland

Field Research and Motivation: Experiential Learning in the Parker River Estuary, MA
A long-term salt marsh research project was instituted at a New England private school as an experiential learning intervention. The treatment group (N=9) studied the salt marsh ecology curriculum over a one month period and participated in two field days, identifying vegetation and measuring soil salinity, while the non-treatment group (N=15) was only exposed to the curriculum in the classroom. Achievement and environmental perspective remained unchanged regardless of intervention participation but treatment students had significant gains in intrinsic motivation.

Orientation  Heather Swanson, Austin, TX
The University of Texas at Austin High School (UTHS), Austin, TX
EMERGE, Bozeman, MT
Facilitator: Rebecca Schumacher

Exploring the Potential of Virtual Office Hours for Online Science Students
Virtual office hours (VOH) are one way for teachers to support students in online courses. An initial study implementing VOH with online-only students did not proceed as planned, but VOH were successfully implemented in an alternate setting, with blended learning high school science courses. Conclusions were that VOH can be an effective way to increase student engagement in a blended learning course. Also discussed was how to apply findings from this study towards establishing VOH in different online environments.

Wednesday, July 6, 2016

7 am  Amy Chase, Lewiston, ID
Lewiston Senior High School, Lewiston, ID
Facilitator: Robert Maul

The 5E Instructional Model for the Next Generation Chemistry Classroom
The purpose of this study was to determine if scientific literacy skills centered on the Science and Engineering Practices from the Next Generation Science Standards would be impacted by the 5E Learning Cycle pedagogy in a general chemistry classroom. Results suggested an attitudinal and cognitive gain in students’ literacy skills during the 5E units with most growth occurring within the Science and Engineering Practice of planning and carrying out investigations.
The Effect of Structured Cooperative Learning Strategies on Student Achievement in Science
This classroom research project was to determine if implementing structured cooperative learning would increase students’ achievement and retention of content in the chemistry classroom. Test scores, student surveys, interviews and teacher journaling were used to measure the outcome of the treatment. Though no significant difference in the students’ achievement in terms of test scores of the treatment and non-treatment groups was realized, students exhibited higher engagement in the learning process and recognized benefits to working in structured cooperative learning group.

Cultivating Young Minds and a Sense of Place through Science Based Teacher Professional Development
This project addressed integrating a sense of place into science curriculum at Colegio Monte Verde, an environmental school on Chiloé. It was designed to use the state mandated science curriculum as a frame, onto which more local place-based content was applied in a manner that helped establish the community as a living laboratory for learning. Teachers participated in content development through off-site field courses and in-school workshops, modeling of lessons with students, and a presentation of locally inspired lessons.

The Effects of Standards-Based Grading in the Middle School Science Classroom
Standards-based grading fosters student learning by aligning assessments with standards, defining learning goals, assessing learning goals by using proficiency level rubrics, and encouraging improvement through reassessment throughout the learning process. Research indicates increases in student comprehension and documents student motivation shifting from working towards a meaningless letter grade towards motivation to learn. This study examines student surveys and interviews for changing student motivation and attitudes towards grading, and tracks proficiency of learning goals with the implementation of standards-based grading.
Wednesday, July 6, 2016

9 am   Kristin J. Tesiny, Valencia, CA
        Porterville High School, Porterville, CA
Facilitator: Samuel Cohen

How the Use of Current Events in an Earth Science Classroom Affects Student Scientific Literacy, Content Knowledge, and Engagement

Many students experience a disconnection between inside and outside the classroom. My action research-based classroom project explored if current events in an Earth science classroom can increase students’ scientific literacy, content knowledge, and engagement. Classroom instruction involved a lesson using a current event compared to a lesson without a current event. The analysis showed that the only significant change in students was engagement during the current event instruction. Future research might include how technology can assist students with current events.

9 am   Sarah Keefer Venturi, Wawaka, IN
        West Noble High School, Ligonier, IN
Facilitator: Jordan Byrd

Targeted Language Development in the Science Classroom

This project was designed to investigate if direct language instruction could impact English Language Learner students’ literacy skills and content knowledge acquisition. Students were coached in the Reading for Meaning Strategy, an active reading strategy that incorporates the four language skill areas: reading, writing, speaking and listening. Student assessments and artifacts revealed gains in content knowledge and improvement in writing skills.

10 am  Shauna Baron, Gardiner, MT
        Yellowstone Association Institute, Gardiner, MT
Facilitator: Ryan Call

Improving the Urban Youth Experience in Outdoor Science Education: Through Improved Teacher Training Techniques

This research details the needs assessment phase for a new training module for the Yellowstone Association Institute to create more effective instructors working with urban and underserved youth. The study revealed that students achieve more when provided with a safe learning environment, where they valued as individuals and the teaching methods are student centered. A successful training module promotes a culture of caring and respect, and develops an instructor’s cultural competence for working with diverse populations.

11 am  Jennifer R. Konopacki, Twin Bridges, MT
        Sheridan Elementary School, Sheridan, MT
Facilitator: Sarah Bauer

Outdoor Education: The Effects of Outdoor Science Learning on Student Success

This project focused on involving students more in the outdoors as part of their regular classroom curriculum. Outdoor educational activities, as well as guest speakers from the community were used to supplement current curriculum. The purpose was to investigate student motivation and attitude towards learning science, and level of concern for the environment.
Wednesday, July 6, 2016

12 pm  Patsy Jones, Chandler, AZ  
        Casteel High School, Queen Creek, AZ
Facilitator: Alyson Darconte

**Teaching Data Literacy in High School Biology**

This research project investigated ways to increase student engagement and data literacy skills in a high school biology classroom. Lessons were designed to incorporate data literacy instruction along with acquiring authentic data into existing units in ecology and evolutionary theory. The study showed that student engagement increased with the use of real data and skills in data literacy were improved using focused instructional lessons.

12 pm  William J. Sparks, Sylva, NC  
        Jackson County School of Alternatives, Sylva, NC
Facilitator: Justine Fox

**Using Cell Phones Constructively in the Science Classroom**

Over the past ten years I have seen the evolution of the cell phone taking place. I watched the demand for cells phones grow from a few students having them to every student in my classes having a smart phone. You will see students taking selfies or checking Facebook on a regular basis. I incorporated their phones into my lesson with hopes that this will alleviate the constant war that has developed in my classroom.

1 pm  Bryan Idleman, Gilbert, AZ  
        Higley High School, Gilbert, AZ
Facilitator: Julie Welde

**Inquiry Based Learning in the Chemistry Classroom**

Research has shown that motivation is a key factor in determining a student’s success in learning. Inquiry based learning is said to give science students a deeper understanding and an improved perception of learning in the science classroom by allowing them to take control of their learning experience. This study examines the impact of inquiry based lessons on both student performance and student motivation in the high school chemistry classroom.

2 pm  Christina L. Pavlovich, Livingston, MT  
        East Side Intermediate School, Livingston, MT
Facilitator: Mary Noel

**Teacher Conceptual Framework and Gains in Relation to Student Scientific Literacy Achievement**

Intermediate teachers face multiple content areas and high stakes testing and report little time for science instruction due to pressures in English language arts and math. This study followed teachers through professional development that blended English language arts and science practices into applied scientific literacy learning. The study’s main focus was to determine if application of science practices in language arts had an effect on student attitudes and achievement compared to teacher attitudes, instructional pedagogy, and reported science instructional time.
Using Tablets for Motivation and Engagement in a Seventh Grade Citizen Science Program

Technology is growing in the classroom and workplace. Usually, it is left behind when students are engaged in the outdoors. This study examines the use of technology outside the classroom and in an outdoor citizen science program. The main focus of the study was to measure the engagement of seventh grade students while using tablets to view a nearby osprey nest via camera. Students gained greater understand of how ospreys are connected to the studied environment.

Understanding the Effects of Using Case Studies on Student Learning in a Community College Applied Science Classroom.

Utilizing case studies is a successful instructional tool in the medical professions. This action research investigated how the use of case studies in an introductory healthcare class affects student learning. Although quantitative data seemed conflicted in two separate sections, qualitative data overwhelmingly illustrated increases in learning and value. Pre- and post-unit test scores, formative assessments, surveys, interviews, journaling, and final exam scores were evaluated for changes in comprehension, retention, and value.

Immersing Students in Authentic Experiences and Scientific Practices to Increase Achievement, Motivation, and Attitudes towards Science

This study assessed how constructivist teaching strategies impacted achievement, motivation, and views towards science in a college biology course for non-science majors. Historically, student performance and interest is low in this course. The intervention engaged students in scientific processes by way of inquiry-based labs, argumentation, and field trips, among other activities. Results indicated a remarkable increase in content knowledge. While there was a slight change in scores for motivation and views towards science, those results were not statistically significant.
Wednesday, July 6, 2016

3 pm  Melissa Yourey, Pottsville, PA  Reid 102

Pine Grove Area High School, Pine Grove, PA
Facilitator: Lisa Rossanna

*Using Current Science Articles to Evaluate the Effect on Students Seeing Relevance of Science in their Everyday Lives*

This study examined whether current events helped high school students integrate environmental science concepts into their lives, if they influenced ‘aha’ moments, and if the current events affected student learning. In order to evaluate the effectiveness of current events in the classroom, students completed writing prompts, were surveyed and interviewed, class discussion followed the writing prompts, teacher journaling took place, and the students were assessed on corresponding free response questions on the three units’ summative assessments.

4 pm  Bob Ellenbecker, Missoula, MT  Reid 101

Big Sky High School, Missoula, MT
Facilitator: David Wilson

*The Impact of the Health Science Academy at Big Sky High School on Academic Achievement and Preparedness for College*

The career academy is a secondary reform model that has been in development for 40 years. In 2012 the Health Science Academy (HSA) was launched in an effort to increase graduation rates and enhances college and career readiness. This study was an evaluation of the HSA’s impact on student attitude, academic achievement and preparedness for college. Results indicate that the HSA had minimal impacts on academic achievement, but had a positive impact on attitude and preparedness for college.

4 pm  Alison Rockwell, Boulder, CO  Reid 102

National Center for Atmospheric Research, Earth Observing Laboratory, Boulder, CO
Facilitator: Christopher Shaw

*Broadening Participation in Geoscience Education through a Program Needs Assessment*

Anomalies were found in the diversity of users and use of available assets in a geo-science education program from 2008-2015. A needs assessment was conducted to identify performance gaps in the program, and included a systematic gap analysis to determine to what degree the empirically observed gaps were representative for the program resulting in a data-driven recommendation action plan to close the gaps with the intention of broadening participation.

5 pm  Annie Tête, New Orleans, LA  Reid 102

Louise S. McGehee School, New Orleans, LA
Facilitator: Jacqueline Hall

*Impact of Digitally Mediated Scientist-Classroom Partnerships with Middle School Girls*

Women are underrepresented in science and engineering fields. Interactions with female scientists have been shown to improve girls’ attitudes towards science careers. This study explored the use of Skype to create scientist-classroom partnerships. The main focus of this study was to evaluate the change in student perceptions about scientists following a series of Skype sessions with a female scientist. Student content knowledge and the impact of facilitating the partnerships on teacher workload and attitudes were also addressed.
Wednesday, July 6, 2016

6 pm  Henry B. Lacey, Littleton, Colorado  South Platte Park, Littleton, Colorado
Facilitator: Allison McClain

*Impacts of Ecology-Themed Interpretation Programs at a Colorado Open Space Preserve on Attitudes, Beliefs, and Knowledge*

Interpretation is a tool by which nature preserves can engender emotional and intellectual linkages between the resources protected and the human communities that benefit from them. This study examined five interpretation programs. The purpose was to determine the degree to which ecology-focused interpretation practices caused participants to develop a positive attitude about wildlife conservation. An evaluation of the literature relevant to interpretation, analysis of the impact of the interpretation programs under study, and determination of positive attitude outcomes was performed.

6 pm  Jason R. Garver, Bozeman, MT  Willow Creek School, Willow Creek MT
Facilitator: Bridget Sparks

*Science Outdoors: Does the Learning Environment Influence Student Interest, Engagement, and Cognition?*

The purpose of this study was to determine whether bringing students outdoors to learn science has an effect on student motivation, cognitive engagement, and achievement. A small student population limited the study to seven individuals (N=7) ranging from sixth grade through tenth grade. Data was collected in a case study format, monitoring individual progress over time. Data indicated that there is a positive correlation between student interest, engagement, and achievement with going outdoors to learn science.

Thursday, July 7, 2016

7 am  Jared Torgerson, Duchesne, UT  Duchesne High School, Duchesne UT
Facilitator: Angela Marshall

*A Comparison of Project-Based Learning and Conventional Teaching Methods in Earth Science*

Project-Based Learning has been shown to enhance student understanding. Correct design, use, and implementation of PBL is an effective strategy to engage students in science concepts and deepen understanding. This study examined PBL methods in ninth-grade Earth science. The main focus of this study was to compare the value of PBL to conventional teaching methods. Effectiveness of project and conventional methods were analyzed and evaluated.
Thursday, July 7, 2016

7 am  Tina Kristine Rogers, Woodward, OK
       Woodward Middle School South, Woodward, OK
Facilitator: Kimberly Forsythe

**The Effects of Using the iPad to Zap Zeros and Increase Student Comprehension of Science**

This study implemented the use of the iPad in a middle school science classroom to give students digital options for the completion of assignments to lower the frequency of zeros. In addition, student comprehension of science concepts was measured. The results suggested that the use of the iPad successfully reduced the frequency of zeros and increased science literacy in the 7th grade science classroom setting.

8 am  Jess Rowell, Houston, TX
       Independent Education Consultant, Remote Delivery to Teachers Nationwide
Facilitator: Tracey Bidwell

**Creating Journeys: Interactive NGSS-Aligned Reading Passages for Secondary Science Classrooms that Integrate Current Science and Engineering Research**

In addition to hands-on curriculum, science teachers need innovative resources to support teaching of the Next Generation Science Standards (NGSS), especially in scientific literacy. Join Jess Rowell as she creates Journeys, or interactive reading passages, that connect science classrooms with current science, all over the world, through scientist and engineer interviews and real-world data analysis scenarios. In 2016, Journeys' NGSS alignment and their overall usefulness and relevance, using a pilot Journey called Researching Dolphins, was studied with science teacher peers.

9 am  Lynda N. Wright, Smiths Station, AL
       Glenwood School, Smiths Station, AL
Facilitator: Ryan Harvey

**The Impact of Flipping the Classroom on Ninth Grade Biology Student Learning and Problem Solving Skills**

Today's high school student relies heavily on the use of technology and the internet to communicate and to become informed. The flipped classroom utilizes this tendency by incorporating internet use to deliver instruction as homework, freeing class time for more interactive experiences. This study evaluated the effects of the flipped classroom in regards to learning, problem solving, attitude, engagement, and student preference for instructional approach. Evaluation tools were summative assessments, student surveys, self-evaluations, and student written feedback.

9 am  Dana L. Donlon, Blairstown, NJ
       West Morris Central High School, Chester, NJ
Facilitator: Stephen Cannici

**The Effect of a Supported Flipped Learning Approach on Student Learning, Engagement and Participation in a High School Chemistry**

The flipped learning approach moves direct instruction out the classroom through the use of video lessons in order to incorporate dynamic, student-centered activities during class time. This study examined the effect of integrating the flipped learning approach along with technology-based formative assessments on student academic achievement, engagement, and participation in a high school chemistry course. Analysis of test data, student survey responses, student interviews, and teacher observations indicated that, while student engagement and participation increased, academic achievement remained consistent.
Thursday, July 7, 2016

10 am  Leslie L. Moncur, Atlanta, GA  Reid 102
Crawford W. Long Middle School, Atlanta, GA
Facilitator: Martin Tawill

**Does Science Vocabulary Instruction Increase Student Comprehension with 7th Grade Students in Middle School**

As a middle school science educator, we understand that vocabulary plays a crucial role in all content areas. Word knowledge is critical to reading comprehension and determines how well students will be able to comprehend the texts they read in middle school science. Vocabulary instruction must be taught directly and indirectly. With this in mind, my main study focus was to determine if vocabulary instruction will increase student’s comprehension of 7th-grade students in middle school using various vocabulary strategies.

11 am  Amy C. Listenik, Jeffersonville, VT  Reid 101
South Burlington High School, South Burlington, VT
Facilitator: John Wilke

**Effects of Focused Literacy Techniques on Scientific Writing Skills in the Chemistry Classroom**

It was observed that students have difficulty expressing scientific language and information in their written work. This project investigated whether dedicating time to teaching scientific based literacy skills in the classroom had an effect on student comprehension of content specific language and student ability to effectively use data and evidence in written work. Quality of writing increased after intervention and students expressed that science classes should incorporate literacy based activities.

11 am  Bridget M. Sparks, Cincinnati, OH  Reid 102
Princeton High School, Cincinnati, OH
Facilitator: Linda Townley

**Teaching Physical Science with Scientific Inquiry and Science Notebooks**

Scientific inquiry is at the foundation of the Next Generation Science Standards. Science notebooks are an important compliment to inquiry for the purpose of deeper thinking and making connections. The study’s main focus was to see if achievement and engagement of students improved with scientific inquiry activities and the use of science notebooks. The results indicated that students’ pre to post-test unit scores improved. Students also showed increased engagement during lessons that included inquiry and science notebooks.

11 am  Renee M. Lauterbach, New Berlin, WI  Reid 452
Hmong American Peace Academy, Milwaukee, WI
Facilitator: Ann Knight

**Implementing Interactive Science Notebooks into 6th Grade Classrooms**

Interactive science notebooks have been found to promote learning, improve communication, and provide insight into student thinking. This study focused on implementing interactive science notebooks into 6th grade science classrooms. The main focus was to see how students’ learning, thinking, engagement, and communication were impacted by the use of these notebooks. Data were collected and analyzed in the form of surveys, interviews, assessment scores, and student observations.
The Effects of Technical Writing Strategies on Student Writing and Scientific Comprehension

The purpose of this study was to increase scientific comprehension through improved technical writing using Self-Directed Inquiry (SDI) and Calibrated Peer Review (CPR). There was no significant increase in scores using SDI. However, there was a significant increase in normalized gain using CPR. Both teacher and student attitudes were positively affected by the addition of CPR due to ease of implementation and increased feedback. Attitudes were negatively affected by the time requirement and uncertainty of activity results using SDI.

Testing the Effects of Paul Andersen’s QuIVERS Teaching Method on Intelligence Mindset and Achievement in a 9th Grade Biology Classroom

The 5E learning cycle using student-led, inquiry based learning, has been shown to be an effective teaching style. Paul Andersen, Montana Teacher of the Year, combines blended learning and the 5E learning style in a technique called QuIVERS. Whether students have a growth mindset or a fixed mindset can dramatically impact how a student learns and performs on assessments. This study evaluates the impact of the QuIVERS Teaching Method on student mindset and achievement in a ninth grade Biology classroom.

The Effects on Student Academic Achievement and Student Self-Confidence of a Course-Specific Textbook Written for Applied Electronics Math 2

Research has shown that textbooks have a great influence on student learning. Due to rising costs, the Applied Electronics Math courses at Madison Area Technical College have been taught without textbooks. This study involved the writing and testing over a period of three semesters of a reasonably-priced textbook specifically aimed at Applied Electronics Math 2. The study’s main focus was to determine the effects of a course-specific textbook on student achievement and student self-confidence in the field of electronics.
1 pm    David J.H. Wilson, Wilbraham MA
        Pathfinder Vocational Technical High School, Palmer MA
Facilitator: Amber Lloyd

**Vocational Hands-On Activities in High School Technology/Engineering Classes**
Problem based hands-on teaching has been shown to provide a sound foundation for instruction and student engagement. Hands-on experimental activities have been at the core of science classrooms and administration has lobbied teachers to expand hands-on integration between academic and vocational departments. This study examined the impacts that an increase in vocational hands-on activities would have on 9th grade students. Four vocational shop areas were selected and students were monitored and assessed accordingly with the corresponding technology/engineering framework.

2 pm    Todd Samet, Petaluma, CA
        Redwood High School, Larkspur, CA
Facilitator: Kristin Tesiny

**The Effect of Three-Dimensional Instruction Aligned to the Next Generation Science Standards on Student Learning in High School Science**
Next Generation Science Standards stress three-dimensional instruction – integrating disciplinary core ideas, science and engineering practices and cross cutting concepts – to support deep student learning. Study compares student learning in units in aligned and not aligned to NGSS. Data measure learning of disciplinary content at acquisition and application levels, as well as application of science and engineering practices. Learning was also considered in high, middle and low performing students. Treatment showed greatest effect in acquisition learning for lowest performing students.

3 pm    Drew Fiala, Downers Grove, IL
        Payson High School, Payson, AZ
Facilitator: Kristin Waverka

**Using Differentiated Physics Homework to Create Self-Regulated**
At the beginning of the year, students learned the Question Formulation Technique, which introduces the ideas of metacognition, convergent, and divergent thinking, as well as open and close-ended questions. During each unit, students used the technique to compile a list of questions, ultimately identifying five for research. Students then created differentiated homework capable of teaching others in the form of their choice. Many students improved their self-regulatory skills with a marginal improvement seen in attitudes about learning at home.

3 pm    Brian Good, Leola, PA
        Annville-Cleona High School, Annville, PA
Facilitator: Jason Garver

**The Use of Computer-Based and Inquiry-Based Learning Activities to Differentiate Instruction for High School Chemistry**
In many courses, teachers must meet the needs of diverse learners in a single classroom. This study focused on the use of video lessons, podcasts, guided inquiries, computer simulation labs and instantaneous feedback to teach more challenging topics to advanced students. Video lessons with instantaneous feedback were used as remediation activities to help struggling students.
Teaching Science to Students of the Introverted Type

Going to school is an extraverted action. Since about half of all students identify with introversion, the goal of this study was to examine some teaching strategies for my introverted students. The study’s main focus was to determine if a low-stimulation environment with self-paced notes and simulations, online discussions, and a focus on key points would benefit the learning of an introverted student. Pre- and post-tests, surveys, interviews, and teacher reflection were used to analyze the benefit of this intervention.

The Effect of Using Nearpod as a Tool of Active Learning in the High School Science Classroom

Active learning has been shown to be very successful in high school science classrooms. The introduction of one-to-one computer programs has created both new challenges and opportunities for educators wishing to integrate active learning strategies into the curriculum. This study focused on the active learning program Nearpod. The study’s primary focus was to determine if high school science students benefitted from active learning strategies with Nearpod compared with more traditional active learning strategies.

Replacing Lectures and Direction-Following Labs with Discussions and Inquiry-Based Labs in Ninth Grade Physics

Student centered learning has been shown to improve problem solving ability and conceptual understanding in many studies. This project sought to help students take more ownership of their learning and improve their performance by replacing lectures with discussions and cook book labs with inquiry based lab exercises. While student confidence and attitude did not show any improvement, overall performance generally improved. The majority of students enjoyed the new approach and wish to continue using it.

The Effects of a Strategic Note-Taking Strategy in Virtual School Mathematics

For this action research-based classroom investigation, the strategic note-taking strategy, Cornell Notes, was introduced to a group of middle school students from a virtual school to increase their math skills and improve their perception of note-taking. Students were provided note-taking workshops to teach and encourage them to take and organize notes during virtual classes. The results indicated that there was little effect on student math performance while there was some modest improvement in regards to student perception.
Friday, July 8, 2016

7 am  Sam Cohen, Dallastown, PA  
       Dallastown Area Senior High School, Dallastown, PA  
Facilitator: Kathryn Gangel  
Gamification on Student Performance in a Secondary Science Classroom  
Gamification as a means of motivation in the classroom has been promoted as a means of improving student performance. The purpose of this study was to investigate the impact of an instructor-designed video game on a ninth grade general science classroom. The study also looked at student and parent perceptions of gamification within the classroom and the impact on the role of the teacher.

7 am  Ange M. Jones, Saint George, KS  
       Wamego Middle School, Wamego, KS  
Facilitator: Amy Chase  
Project Based Learning as a Means to Increase Student Learning and Interest in Earth Science  
Studies have shown that PBL is an effective instructional method that engages students with a deeper level of understanding of a given topic through the presentation of a problem to solve. In this study, PBL was applied to middle school classes studying Earth science, specifically plate tectonics and erosion. The study’s main focus was to determine if project based learning would increase student learning, with a secondary focus on increasing student engagement and interest in Earth science.

7 am  Alexandra B. Disney, Holderness, NH  
       Holderness School, Holderness, NH  
Facilitator: Patti Jones  
Learning the Nature of Science with Open Inquiry in High School Chemistry  
The twenty-first century science classroom involves inquiry learning, in which students investigate phenomena through science and engineering practices. This study investigated whether engagement in open inquiry investigations impacted student understanding of the Nature of Science, the way scientific knowledge develops. Through multiple formative assessments with feedback, students most improved their confidence in and ability to design testable scientific research questions and corresponding investigative plans. The results indicated that students struggled applying their investigative process to scientific methodology as a whole.

7 am  Lisa M. Rossana, Downingtown, PA  
       Bishop Shanahan High School, Downingtown, PA  
Facilitator: Jennifer Konopacki  
Scientific Literacy: The Effects of Incorporating Literacy into a High School Environmental Science Classroom  
Literacy spans all disciplines and educational levels. Literacy has become increasingly important in understanding course content beyond the scope of a classroom. The incorporation of scientific literacy into science classrooms has been shown to encourage critical thinking skills, connect interdisciplinary concepts to content material, and to help students make real-world connections to their everyday lives. The main focus of this study was to determine if the incorporation of scientific literacy ancillary material would increase students’ overall scientific literacy in environmental science. In addition to assessment scores, students’ confidence and attitudes about learning science were also assessed.
Development of an Economic, Mobile, Dual Oxygen and pH Sensor
Optical pH and oxygen sensors have various advantages over Clark amperometric oxygen electrodes, including portability and utility in aqueous environments unsuitable for the Clark electrode. The goal of this study was to develop a dual pH and oxygen-sensing probe that can be cost effectively developed and used in a variety of settings. The oxygen-sensing component was built, programmed and analyzed for effectiveness in this study.

Building a Structure of Student Support with a Full Head of S.T.E.A.M., Science, Technology, Engineering, Art and Mathematics
The support of family has been shown to foster successful students at all age levels, our alternative education students are no exception. This study was an attempt to strengthen that structure of support through a series of after-school family science nights, using S.T.E.A.M., science, technology, engineering, art and math as the foundational theme. The findings of this research show that we need to continue to push for parental support.

The Effects of Gamification Using the 5e Learning Cycle (Quivers) on a Secondary Honors Chemistry Classroom
Incorporating compelling aspects of video games into teaching and learning (gamification) has been shown to positively affect student engagement, achievement and motivation in courses, including those in science, ranging from primary to post-secondary education. This study examined gamification and the 5e learning cycle in a high school chemistry course. The study’s main focus was to improve student academic performance and foster student identity as a scientist. Evaluation of gamification methodology, analysis of presentation methods, and determination of educational benefits were performed.

The Effects of Science Literacy Instruction on Student Ability to Gather Evidence to Support Scientific Claims
Our current society is technologically and scientifically driven. As such, it is imperative as science educators to help ensure that students leave high school scientifically literate. This study examined the ways in which teaching scientific literacy through cycles of constructing and critiquing scientific arguments affected student ability to gather evidence to support scientific claims. These cycles included the use of in text annotations, Socratic seminars, and constructing and critiquing claim, evidence, and reason charts in groups.
**Advanced Engineering Tutorials in College Physics**

Lecture-based physics courses have been shown to result in low levels of understanding of basic course concepts regardless of teacher skill, experience, or institution. Physics education research studying the effectiveness of varying methods of instruction has led to the use of inquiry-based classes, resulting in increased comprehension of fundamental physics concepts. This study attempts to improve upon these methods through the incorporation of engineering methodologies which specifically focus on realistic applications, symbolic solutions, and optimization for physics problems.

**Using Self-Questioning as a Self-Reflective Approach to Problem Solving in High School Chemistry**

The use of questions and problem solving has been established in fields such as reading comprehension and mathematics. This study investigated the impact of self-questioning strategies on students’ problem solving ability. Based on collected data, self-questioning by the students did not increase their success at solving chemistry problems compared to students that did not use self-questioning.

**The Effects of Explicit Science Vocabulary Instruction on Vocabulary Acquisition on the Flathead Indian Reservation**

Explicit vocabulary instruction is a teaching strategy that involves a teacher selecting three to five vocabulary words and focusing instruction around those words. When working with students who are English Language Learners or struggle with vocabulary acquisition, this strategy is thought to be very successful. This action research examined how an increase of explicit vocabulary instruction impacted students’ ability to acquire new words, engage in class, and feel prepared for assessments.

**The Effects of Project-Based Learning in the Middle School Science Classroom**

Effective problem solving is a vital 21st century skill leading to successful careers in academics and the workforce. Project-Based Learning (PBL) was implemented in a middle school earth science classroom with the intent of challenging students to solve real-world problems through collaboration, critical thinking, and problem solving while learning to take initiative and build confidence. The results indicated that PBL instruction positively affected students’ problem solving abilities and confidence.
Friday, July 8, 2016

2 pm   Alyson L. Darconte, Milesburg, PA Library – Room 1151 (Innovative Learning Studio)
       Bitburg Middle–High School, Bitburg, Germany
Facilitator: Leslie Moncur

The Effect of Project-based Learning on Academic Achievement in a Freshman Biology Classroom
Instruction via Project-based learning is applauded as a way to help students make connections between what they learn in class and their everyday lives. This research project focused on the implementation of project-based learning instruction in a freshman biology classroom. The focus was to increase student attitude towards science, increase academic achievement, and reinforce the connection between biology and the real world. Student assessment scores, surveys, interviews, and teacher journal entries were analyzed as part of this project.

3 pm   Mary Dolores Noel, Colstrip, MT Reid 101
       Chief Dull Knife College, Lame Deer, MT
Facilitator: Tina Rogers

Team Work in an Introductory Organic and Biochemistry Classroom
Teacher guided group work exercises have proven results in the academic achievement of students. I developed and implemented a group dynamic outside of the regular classroom setting. Students were assessed on their contribution to their group in lab settings, in group meeting sessions and on formative assessments. The main focus of the study was to determine if the project helped students gain self-advocacy and work habits that to overcome hurdles innate to college and other higher academic work.

3 pm   Julie M. Welde, Mount Holly, NJ Reid 102
       Rancocas Valley Regional High School, Mount Holly, NJ
Facilitator: Eric Swanson

The Implementation of a Flipped Classroom to Increase Student Achievement and Engagement in High School Chemistry Students
A flipped classroom was implemented in chemistry classes based on my observation that students’ concentration, engagement, and participation in class was decreasing. The students watched informational videos for homework, participating in engaging activities during class. No statistical differences in the summative assessment scores were noted between the students in the flipped classroom versus the traditional classroom. Flipped classroom students gained a sense of responsibility for their learning and I became a more reflective teacher as a result of this project.
Friday, July 8, 2016

4 pm  Deborah Mansour, Indianapolis, IN  
Indiana Connections Academy PLCs & National Science Teachers’ Association Listservs & MSSE students, Indianapolis, IN & Nationwide
Facilitator: Melissa Yourey

**An Investigation of the Preparation of Science Teachers to Incorporate Engineering Design Principles into their Science Curricula**

Incorporating engineering design principles into science curricula is part of the Next Generation Science Standards (NGSS) with an intended purpose of moving science education forward to the 21st century. This study examined teacher preparation, attitudes, and level of knowledge about the engineering design process and how it can be incorporated into their science curricula. Teachers were surveyed for their perceptions of and experiences with engineering concepts. Analysis of the data was performed and suggestions for future research avenues were identified.

4 pm  Ryan J. Call, Olathe, KS  
Shawnee Mission West High School, Overland Park, KS
Facilitator: Sarah Venturi

**The Effects of Two-Column Notes on Science Assessment Scores**

There is an ever-increasing emphasis being placed on assessment scores and student performance on tests. Notes have been a commonly used study tool to help students organize and review the material leading up to these assessments. This study searched for a correlation between teacher-guided, two-column notes and test performance. The study’s secondary focus was to identify if assessment results had any influence on the value students place on their notes and how helpful notes are perceived to be.

5 pm  Allan Jay Dinglasan, Markham, Ontario, Canada  
St. Brother Andre Catholic High School, Markham, Ontario, Canada
Facilitator: Shauna Baron

**The Effects of Using Strategic Approaches to Multiple-Choice Questions on the Confidence Level and Motivation of Gifted Students in Advanced Placement Chemistry**

In this investigation various strategies were implemented with the purpose of improving students’ confidence and motivation with multiple-choice tests in Advanced Placement chemistry. The effects of various interventions were examined for any impact on the confidence students had on multiple-choice evaluation and on their motivation to improve. The observed changes point to time allocation for tests as well as students’ concurrent mastery of content and strategy as unforeseen variables that affected how their perception and belief impacted their actions.
Friday, July 8, 2016

6 pm Martin A. Tawil, Cape Coral, FL
Florida SouthWestern State College, Fort Myers, FL
Facilitator: Joseph Levitt

Classroom Debates: A Tool to Enhance Critical Thinking in Science
The purpose of this study is to examine the effects of debating on the perception of students’ critical thinking disposition. The participants were members in one of my Cornerstone Classes at Florida SouthWestern State College that was randomly selected. The data collected during this study were student surveys, student interviews, researcher observations, and pre and post of the California Critical Thinking Disposition Inventory. The overall results of the study showed that students benefited from the exercise of debating particularly when debating opposing points of view. Students’ disposition to be critical thinkers improved as a result of debating.

Saturday, July 9, 2016

7 am Dan Leavell, San Diego, CA
Vision Charter School, Caldwell, ID
Facilitator: Annie Tête

Modeling in the Science Classroom: Using Inquiry to Increase Understanding and Motivation
The goal of this project was to create an academic atmosphere that promoted the use of creativity and critical thinking that enabled students to solve everyday problems. The use of Likert surveys measured student motivation to complete inquiry projects in the classroom while formative and performance assessment measured their growth with the inquiry process. The students who participated in this research project constructed their own inquiry investigations from an assigned theme designed to have real-world implications.

7 am Steven Merriman, Chicago Ridge, IL
Moraine Valley Community College, Palos Hills, IL
Facilitator: Dana Donlon

The Effect of Group Created Lab Designs on Student Understanding of Content and Science Practices
Problem based labs, in which students are presented with a problem and design their own means of experiment, data collection, and analysis, have been shown as effective in helping students understand content and lab practices. This intervention examined using student designed labs in a college physics course. The focus of the intervention determines if a problem based lab approach was useful in helping student understanding of physics content and science practices. Evaluation made use of pre/post-tests, student interviews and surveys.
The Effects of Increased Science Instructional Time on a Second Grade Classroom

Science learning time has been on the decline because of increased time spent on language arts and math, lack of supplies and equipment, and lack of support from administrators. Connections between math and science seem natural. The study’s focus was to evaluate the effect that increased science class time, enriched with mathematically based skills, had on the students’ understanding of content, as well as interest, motivation and confidence in math and science. Evaluations of scores, surveys, and interviews were performed.

Improving Chemistry Pass Rates in Underachieving Algebra Students Using Review Sessions

Previous studies have shown that math achievement is a proven predictor of chemistry success. Underachieving algebra students were targeted in this study and given extra review sessions outside of the normal classroom experience in an effort to improve pass rates in both the class and on state mandated end-of-course exams. The main focus was to determine if the extra effort required by the teacher resulted in measurable improvements in student achievement, student attitudes and student-teacher relationships.

The Effect of Ranking Tasks and Peer Instruction in a Mathematics Classroom

The use of ranking tasks has been shown to be successful in the high-school physics classroom. In addition, peer instruction has been determined to be a pedagogical method that enhances student success. The main focus of this study was to determine if the use ranking tasks in a peer instruction environment increased conceptual understanding of mathematics. An evaluation of relevant literature, analysis of collected data, and determination of benefits was performed.

Leadership and Science Achievement for Afterschool Students

Social aspects of learning environments have been shown to contribute to a student’s achievement, motivation, and engagement. Leadership activities have helped students develop communication and team skills, leading to peer relationships with less fear of judgment or bullying. This study’s main focus was to determine if including leadership practice into Teton Afterschool science enrichment could increase student science achievement, and self-perceptions as leadership, while decreasing disruptive behaviors. Literature evaluation, examination of student data, and determination of educational benefits were performed.
Using Literacy Strategies and a Growth Mindset Intervention to Improve Performance on Standardized Biology Concepts

It has been shown that students who work within a belief system in which they can change their intellectual ability are more likely to use the explicitly taught learning strategy for self-improvement. This study examined the use of close reading in a growth mindset designed biology classroom. Student scores demonstrated increased test performance and increased motivation to use literacy strategies on the standardized exam. Increased student engagement was reported as students saw a purpose to the learning process.

Impact of Chukwin Mini-Unit on Students' Understanding of Natural Selection

A constructivist-based mini-unit designed to teach students about natural selection, using imaginary creatures and simulation games, was tested in three diverse locations. The activities were found to have a statistically significant impact on students' understanding, which was retained even weeks later. Further, the mini-unit had a positive effect on student engagement and was overwhelmingly found to be both fun and a valuable learning experience by teachers and students alike.

The Effect of Math Strategy Notebooks on Executive Function

The executive functions of working memory, inhibition, and cognitive flexibility play a vital role in academic success in the math classroom. The use of notebooks has been shown to be effective for reasoning and communication in science classrooms, however, a targeted math strategy notebook, specifically to support executive functions has not been thoroughly explored. This study examined if using math strategy notebooks would increase the executive function of working memory, inhibition, and cognitive flexibility in the second grade math classroom.

The Effect of Supplemental Online Tutorials on Chemistry Students Diagnosed with ADHD

Students who are diagnosed with Attention Deficit Disorder (ADHD) have difficulty concentrating for extended periods. This project was designed in order to assist this population of learners in a high school chemistry course. Two treatments were implemented. Students watched online tutorial videos with or without embedded quizzes. Data concluded that the treatments were extremely successful. The students performed better on formative assessments in addition to increasing their confidence levels and decreasing anxiety levels surrounding the study of chemistry.
12 pm  Anthony E. Altiere, Duluth, MN  
Two Harbors High School, Two Harbors, MN  
Facilitator: Anna Shearer  
**The Effects of Cooperative Learning Structures on Traditional Instruction in a Middle School Science Classroom**  
Cooperative learning structures provide an ideal setting for students to actively engage with one another in the learning process. This study examined the effects of utilizing cooperative learning structures on student engagement, changes in student’s attitudes towards Science 8, and effects on student learning. Data showed an increase in engagement between classmates and in positive attitudes towards Science 8. Though data on student learning was inconclusive, this student-centered approach will be utilized in the future.

1 pm  John Wilkie, Anchorage, AK  
West Anchorage High School, Anchorage, AK  
Facilitator: Jessica Rowell  
**The Effects of Instant Lab Feedback on Student Learning in High School Physics**  
Instant feedback has been shown to be more conducive to student learning than delayed feedback. This study examined the effects of instant feedback on physics labs provided by a preprogrammed Excel spreadsheet. Analysis of student attitudes, student assessment performance, and student options were performed. The results indicated that there was no significant difference in student performance on tests. The results also indicated that students felt more strongly that labs helped them learn physics.

1 pm  Kristin N. Waverka, Lewisville, TX  
Lewisville High School Harmon, Lewisville, TX  
Facilitator: Steven O’Neill  
**The Effectiveness of Concept Checks Used Prior to Lecture in a Flipped Chemistry Classroom**  
Flipped classrooms have proven to be an effective teaching structure for students in different grade levels and content areas. Self-created tutorial videos and concept checks were provided to students in a Pre-AP Chemistry class throughout the duration of this classroom research study. The effectiveness of concept checks on student learning was examined through analysis of collected data. Through evaluation of data, concept checks were shown to increase student assessment scores thus aiding in students’ learning in a flipped classroom.

2 pm  Stephen J. Cannici, Narragansett, RI  
Middlebridge School, Narragansett, RI  
Facilitator: Burke Torgerson  
**The Effects of a Digital Learning Environment on the Work Flow of Students and Teacher in a Language-based Learning Difference Science Classroom**  
Middlebridge School is a program for students with learning disabilities. Additionally, a majority of MBS students have deficits in executive function skills as a primary presenting disability or secondary disorder. The Middlebridge program prioritizes the implementation and instruction of executive function tools and strategies for its students. This study examines a selection of technology interventions targeted to help with executive function skills and efficiency, specifically when students are managing a set of artifacts such as multi-step labs and homework assignments.
Assessing the Next Generation Science Standards and Its Effects on Student and Teacher Learning

Science education is at a crucial time, as states and school districts are considering aligning their standards with the Next Generation Science Standards. The purpose of this study was to investigate the effects of assessing the standards on student and teacher learning. Students were given standard aligned assessments to determine their ability to identifying and using the science and engineering practices alongside the crosscutting concepts. Student enjoyment and comprehension of the content area was also measured.

The Effects of the Flipped Classroom on Chemistry Students

The flipped model has seen an increase in classrooms across the country. With the need to maximize class time due to required state testing, the flipped model offers a possible way to incorporate more hands-on and laboratory activities at the high school level. This study examined the effectiveness of the model compared to traditional teaching methods. The results indicated that although students gained confidence from the flipped model, there was not a significant increase in academic achievement.

The Impact of Argument Driven Inquiry on Student Understanding of Concepts Being Reinforced during Science Laboratory Activities

This action based research project focused on Argument Driven Inquiry as a means to improve student learning during science laboratory investigations in a high school chemistry class. The goal of the research was to see if using argumentation, as part of the laboratory experience would help students use their data to explain what was happening in the investigation. After students presented an oral argument in class and listened to other arguments each individual wrote a conclusion to the laboratory investigation.

Flipping Elementary Professional Development: Providing Time and Flexibility to Learn Inquiry Science

This study flipped the traditional professional development model of a one day, face-to-face session by providing sustained PD through an online learning platform. The five week treatment focused on inquiry science for elementary educators and encouraged participant collaboration. Teachers worked at their own pace and in their own space. Participants’ self-efficacy for learning about and implementing inquiry science was analyzed. An evaluation was conducted to ascertain the treatment’s effectiveness on participants’ inquiry science pedagogy and how the model influenced collaboration.
1999 Graduates
Paul Andersen, Bozeman, MT
Edward Barry, Sacramento, CA
Richard Dees, Billings, MT
Maureen Driscoll, Butte, MT
Janet Erickson, Helena, MT
Beth Farrar, Rapid City, SD
Kerry Friend, Cayucos, CA
Jonathan Hanson, Big Fork, MT
Melissa Henthorn, Turah, MT
Kevin Klawonn, Lennox SD
Nancy Males, Mansfield, TX
Wayne Mangold, Plevna, MT
David McDonald, Sidney, MT
Joy-Lyn McDonald, Sidney, MT
Josey McLean, Great Falls, MT
John Miller, Billings, MT
Randall Morgan, Ketchikan, AK
Kelly Morrow, Kalispell, MT
Marjorie Robbins, Morton, IL
Lisa Rubright, Manhattan, MT
Peggy Taylor, Farmington, NM
Shannon Walden, Fort Benton, MT
Martin Wells, Taylor Mill, KY

2000 Graduates
Randall Carmel, Millersburg, OH
Beverly DeVore, Meeker, CO
Ivanell George, Houston, TX
Jeffery Greenfield, Shepherd, MT
Mark Halvorson, Sidney, MT
Tom Hennard, Stavanger, Norway
Steven Lockyer, Conway, AK
Randall Morgan, Bozeman, MT
Craig Messerman, Missoula, MT
Kathleen Napp, Scottsdale, AZ
Sandy Shutey, Butte, MT
Lisa Snyder, Chelan, WA
James Temple, Glendive, MT
Melanie Vinion, Roanoke, VA
Chryzel Wells, Taylor Mills, KS

2001 Graduates
Robert Beese, Gardiner, MT
Rodney Benson, East Helena, MT
Jeffrey Berg, Auburn, MA
Lawrence Bice, Cottonwood, AZ
Penny Long Blue, Ellsworth, KS
Kathy Brown, Taft, CA
Daniel Campbell, Big Timber, MT
John Etgen, Belgrade, MT
Sharon Fox, Great Falls, MT
Ashton Griffin, Goldsboro, NC
Taylor Hansen, Bozeman, MT
Deanna Hill, Alberta, Canada
Richard Lahti, Fergus Falls, MN
Sanford MacSparran, Logan, UT
Bradley Piroutek, Belleville, KS
Rebecca Reno, Havre, MT
Dov Michelson, Nairobi, Kenya
Jack Schoonen, Dillon, MT
Wendy Sink, Burton, MI
Clinton Stephens, Escalante, UT
Kathleen Thorsen, WI

2002 Graduates
Ronald Abarta, Chehalis, WA
Shannon Bowen, Strasburg, VA
Peter Bregad, Fullerton, CA
Pamela Duncan, Woodstock, IL
Leslie Griffen, Rohnert Park, CA
Jody Hurd, Helena, MT
Tom Huston, Vale, OR
Kevin Kapanka, Kenton, OH
Lloyd Magnuson, Butte, MT
Deanna Mazanek, Athena, OR
Todd Morstien, Lakeside, MT
Melissa Newman, Dutton, MT
Chris Ottey, Bozeman, MT
Robert Pendzick, Canfield, OH
Mary Slack, Wheaton, IL
Michelle Snyder, Athena, OR
Michele Thomas, Bakersfield, CA
Kerby Winters, Vale, OR

2003 Graduates
Cynthia Beale, Fairbanks, AK
John Scott Beaver, Talpa, TX
Amy Berg, Auburn, MA
Eric Berg, Auburn, MA
Nikki Bethune, Sapulpa, OK
Bruce Bourne, Seeley Lake, MT
Kevin Bowman, Jackson, OH
Corbin Brace, Waterville, ME
Kelly Cameron, Ridgefield, WA
Ralph Carlson, Hilmar, CA
Corinne Chavern, Pittsburgh, PA
Susan Choman, E. Wenatchee, WA
Tom Cubbage, Great Falls, MT
Sandra DeYoung, Rye, NY
Sharon Dotger, Raleigh, NC
Phyllis French, Douglasville, GA
Michele Geisler, Rutland, VT
Michael Gregory, Pinedale, WY
Robin Hehn, Roundup, MT
Kathy Howe, Houston, TX
Jack Julian, Cairo, MT
Linah Kendall, Saunemin, IL
David Lee, Taylorville, NC
Brita Lien, Alberton, MT
Eric Matthews, Bozeman, MT
Diane Mayer, Bozeman, MT
Birgitta Meade, Decorah, IA
Linda Moule, Claremont, CA

2004 Graduates
Kimberly Atkins, Annandale, MN
Christopher Cox, Buffalo, WY
Kelley Davis, Moncton, MD
Kirsten DeHart, Houston, TX
Patricia DeEduardo, Lewiston, ME
Terry Edinger, Trabuco Canyon, CA
Mary Margaret Eraci, Lombard, IL
Randall Farchmin, Menomonee, WI
Tina Ferrel, Jackson Center, OH
Larry Gursky, Roy, WA
Emmylou Harman, Kremmling, CO
Penny Juenemann, Two Harbors, MN
Loretta Kane, Natick, MA
Robin Kent, Missoula, MT
Dan Kloster, Longmont, CO
Karen Krieger, Bozeman, MT
Deanna Meyer, West Jordan, UT
Lee Moss, Orangeville, UT
Michael Mulligan, Brazil
Katharine Murphy, Ogden, KS
DeAnn Neal, Midvale, UT
Jeannie Paszek, Reno NV
Glenn Peterson, Greeley, CO
Kim Popham, Lolo, MT
Mary Porter, Melrose, MA
Gordon Powell, Cortland, OH
Chuck Shepard, Saltsburg, PA
Bernie Smith, Colstrip, MT
Dorothy Smith, Colstrip, MT
Scotty Stalp, Germany
Kim Walker, Johnson, KS
Ericka Wells, Jackson, WY
Jeff Yockey, Placerville, CA
Brian Zeiszler, Elko, NV

2005 Graduates
Marc Afifi, Seaice, CA
Christine Bergholtz, Kenai, AK
Matt Bilen, Elgin, IL
Andy Broyles, Aberdeen, SD
Brendan Casey, La Mesa, CA
Peggy Collins, Dudley, MA
Andrew Conger, New Orleans, LA
Michelle Cullen, Valdez, AK
Richard Davis, Frazier, MT
Eric Dougherty, Newport, NC
Brian Edlund, Benson, MN
2005 Graduates - Continued
Rachel Endelman, Monroe, WA
Monica French, Salt Lake City, UT
Nelson Fuamenya, Hunan, China
Ricarda Hanson, Ashland, MT
Kelley Hoffman, Beaver Dam, WI
Diane Holloway, Osaka, Japan
Steve Huffman, Honolulu, HI
Cathy James-Springer, West Indies
Roby Johnson, Yuma, CO
Ryan Kapping, Wadena, MN
Nicole Kirschten, Newfield, NY
Anita Linder, MT, Zion, IL
Brad Loveday, Alamo NV
Justin Lovrien, Sioux Falls, SD
Leslie McDaniel, Memphis, TN
Carla McFadden, Oroville, WA
Valdine McLea
Christine Sundly, Great Falls, MT
Jason Martin, Houston, TX
Jeffery Moll, Haverhill, MA
Stephanie Parker, Tucson, AZ
Jacki Pealatere, Willits, CA
Stuart Perez, Redfield, KS
Lisa Pingrey, Custer, SD
Cary Rosillo, Jupiter, FL
Patrick Simmons, Chesterfield City, VA
Michael Sitter, Polson, MT
Brian Stiff, Billings, MT
Rebecca Toltzman, Bozeman, MT
Nina Tyree, Alexandria, VA
Peggy Van Valkenburgh, Peterborough, NH
Michelle Vitko, Norwich, CT
Bryanna Vogt, Craig, CO
Christy Ware, Newtown Square, PA
Sharon Welter, Golden Valley, MN
Jenine Rued Winslow, San Diego, CA
Emily Wrubel, Peterborough, NH

2006 Graduates
Cheryl Abbott, Palmer, AK
Stacie Laducer Blue, Fargo, ND
Larry Boyd, Marysville, WA
Rich Calhoun, Lakeville, CT
Chuck Campbell, Russellville, AR
Dawn Carson, Shepherd, MT
Alicia Cepaitis, Fort Collins, CO
Sue Counterman, Littleton, CO
Randy Daniel, Huntsville, AL
Yvette Deighton, Sparks, NV
Lindsay Forys, White, PA
Greg Gaffey, Beloit, WI
Amanda Gilbreath, Madison, AL
Tara Hall, Golden, CO
Laura Hauswald, Seattle, WA
Lauren Hinchman, Charlevoix, MI
Laura Holmquist, Bigfork, MT
Joanna Hubbard, Anchorage, AK
Margie Huber, Gahanna, OH
Ken Mager, Oak Forest, IL
Michael Magno, Monroe, MT
Steve Macauley, Boulder, MT
Kevin McChesney, Reynoldsburg, OH
Carla McFadden, Oroville, WA
Rebecca Mentzer, Columbus, OH
Kathy Meyer, Apple Valley, CA
Sherry Miller, West Cokacke, NY
Gina Monteverde, Winthrop, WA
Leslie Morehead, Leslie, TX
Lori Ann Muchmore, Lolo, MT
Troy Nordick, South Jordan, UT
Kenny Peavy, Kuala Lumpur, Malaysia
Rhonda Phillips, Saskatchewan
Vasantha Prasad, Tamilnadua, India
Craig Richards, Calusa, CA
Diane Ripollone, Garner, NC
Brad Shuler, Elk Ridge, UT
Brian Sica, Idaho Falls, ID
Chris Straatman, New Holland, SD
Bonnie Streeter, Whitefish, WA
Brian Sullivan, Great Falls, MT
Michael Telling, Boulder, MT
Paul Tinger, Akron, OH
Genevieve Walsh, Bozeman, MT
Molly Ward, Bozeman, MT
Amy Washtak, Bozeman, MT
Deb Williams, Ames, IA
Rick Wyman, Hardin, MT
Besty Youngman, Phoenix, AZ
Jeff Grom, Belgrade, MT
Angela Haas, Gardiner, MT
Marie Akers Hamaker, Cincinnati, OH
Lisa Hawkins, Taejon, South Korea
Kelly Hayden, Bozeman, MT
Sheila Higgins, Bentonville, AR
Bernard Hoczur, Daytona Beach, FL
Linda Jones, McLaughlin, SD
Julianne Kent, Bradenton, FL
Alexa Knight, Grants Pass, OR
Karla Laubach, Kingston, WA
Catherine Le, San Jose, CA
Rebekah Levine, East Burke, VT
Jean Lewis, Jackson, WY
Cooper Mallozi, Leadville, CO
Michelle Marcil-Spicer, Houston, TX
Kimberly Garner, Anchorage, AK
Jonathan Frostad, Olympia, WA
James Flora, Pleasant Hope, MO
Jane Fisher, Kingston, NY
James Flora, Pleasant Hope, MO
Jonathan Frostad, Olympia, WA
Kimberley Garner, Anchorage, AK
Jeffrey Gaston, Anchorage, AK
Kelly R. Gorski, Kelly, WY

2007 Graduates
Serena Ayers, Springfield, NJ
Jason Barr, Charlotte, FL
Lindsay Bartolone, Chicag, IL
Lesley Chappel Bunch, Palmer, AK
Lisa Carpenter, Shepherd, MT
Mark Calhoun, Tucson, AZ
Jennifer Ceven, Avon, MA
Tonya Chapweske, Miles City, MT
Stacey Dobrosky Cool, Merced, CA
Victor Dalla Betta, Kalispell, MT
Brad Deacon, Montoursville, PA
Dale Dennler, Cresco, IA
Bruce Dudek, Ashland, MT
Brooke Durham, Reynoldsburg, OH
Jane Fisher, Kingston, NY
James Flora, Pleasant Hope, MO
Jonathan Frostad, Olympia, WA
Kimberley Garner, Anchorage, AK
Jeffrey Gaston, Anchorage, AK
Kelly R. Gorski, Kelly, WY

2008 Graduates
Steven Alexander, Canton, NY
Jenelle Bailey, Wenatchee, WA
Marlessa Benson, Appleton, WI
Jennifer Brashear, Brunswick, GA
Matthew Bryant, Memphis, TN
Christopher Carucci, Boston, MA
Jennifer Crow, Mundelein, IL
Deborah Dilloway, Fairway, KS
Tracy Durish, Clarion, PA
Andrew Gelman, Westbrook, ME
John Getty, Bozeman, MT
Molly Godar, Rochester, IL
John Gordon, Weidman, MI
Paul Halfpop, Hardin, MT
Martin Hudson, Hannacroix, NY
Jill Hughes-Koskarek, Hartland, WI
Louise Jones, Naperville, IL
Tim King, Glide, OR
Jeffery Kliepstein, Estes Park, CO
Sara Koffarnus, Westminster, CO
Jonell Prather, Missoula, MT
Charles Reade, Sacramento, CA
2008 Graduates - Continued
Laura Ritter, Royal Oak, MI
Franz Ruiz, El Cajon, CA
Kristina Sappenfield, Eagle, CO
Eric Sawtelle, Whitefish, MT
Donald Selusnik, Delavan, WI
Lisa Skilang, Marion, IA
Linda Smith, Missoula, MT
Kathryn Solberg, Sisseton, SD
Jennifer Swan, Sherman Oaks, CA
Angela Swanson, Rockford, IL
Nathan Whelham, Bothell, WA
Laura Wick, Palmer, AK
Kathleen Woiltvetd, Cut Bank, MT
Jaime Wolfe, Saginaw, MI
Wendy Worrall, Abbotsford, BC
June Wozny, Elkhorn, WI

2009 Graduates
Phillip Ammann, Wilmot, SD
Jenni Vee Andersen, Helena, MT
John Bell, Bozeman, MT
Callan Bentley, Annandale, VA
Carolyn Clark Bielser, Dillon, MT
Terry Carlsten, Walla Walla, WA
Aimee J. Chlebnik, W. Yellowstone, MT
Shelly Chrismon, Yoakum, TX
Christopher Cimino, Citrus Heights, CA
Brett Damerow, Hutchinson, MN
Natalie L. Davis, Livingston, MT
Meg DeAntoni, San Diego, CA
Jenny Derks, Dixon, MT
Thelma Devlin, Dededo, Guam
Lilliam Edmon, Kamuela, HI
Ayn Eklund, Webster City, IA
Steve Eversoll, Kalispell, MT
Richard Fillerpur, Driggs, ID
Thom Flinders, Holderness, NH
Elizabeth Fracchia, Glen Falls, NY
Doug Frost, Salen, NJ
Stacie Fry, Buenos Aires, Argentina
Victoria R. Ginsbourg, Sandy, UT
Rob Greenberg, Chapel Hill, SC
Jenny S. Heathkethal, Edgewater, AK
Patti Jelinek, Memphis, TN
Suzanna Johnson, Auburn, CA
Carlie J. Jonas, Renton, WA
Michael E. Joyce III, Oak Bluffs, MA
Leslie C. Karpiek, De Plaines, IL
Daniel Kinsey, Harlem, MT
Ron Koczaja, Fairbanks, AK
Lucy C. Karwoski Korpi, Holland, MI
Anton Kortenkamp, Monticello, MN
Thomas Kozikowski, Frostburg, MD
Kelly Kramer, DeForest, WI
Karen Kuchar, Naperville, IL
Jason Laducer, Belcourt, ND
Lon LeGrave, Baumholder, Germany
Am L. Manhart, Jackson, WY
Scott D. Masarak, Brussels, WI
Jean Philip Mathot, Irvine, CA
Rory Newcomb, Tallinn, Estonia
Lacy Noble, Three Forks, MT
Loralyn O’Kieff, Valencina, NE
Lau Olsen, Sao Paulo, Brazil
Leslie Pierce, Barrow, AK
Mike Plautz, Missoula, MT
Ronald P. Ramsey, Sewanee, TN
Julie Kallio Robison, Deerfield, MA
Laurie K. Rugemer, Bozeman, MT
Tod M. Samson, East Helena, MT
Bruce Alexander Sinclair, Bermuda
Cathy Steirman, Dubuque, IA
Steve Sundberg, Moline, IL
Nathan Talafuse, Billings, MT
Lucinda Fisher Talsma, Sheldon, IA
Howard Tenenbaum, La Jolla, CA
Tana Verzuh, Durango, CO
Joe Le Weaver, Marion, NC
Patricia J. Weaver, Halifax, PA
Lisa M. Weeks, Eagle Lake, FL
Christine West, Haugan, MT
Erie Wilson, Honolulu, HI
Joe Wright, Hollis, NH

2010 Graduates
Aimee Flavin Artigues, Crested Butte, CO
James T. Ausprey, East Machias, ME
Carol Jane Baker, Billings, MT
Cheryl A. Barrientos, Denville, NJ
Susan H. Barton, Big Sky, MT
Robert David Baughman, Moss Point, MS
Randall Jay Berndt, Rosholt, WI
Susan Berrend, Salt Lake City, UT
Allen R. Bone, Pablo, MT
Christy Bone, Missoula, MT
Larene Bowens, Lame Deer, MT
Donna Brayfield, Springfield, IL
Linda Briggeman, Missoula, MT
Kelly P. Broderick, Bradenton, FL
Rebecca B. Burg, Dixon, MT
Katherine Burke, Helena, MT
Kara Ana Burrous, Sugar Land, TX
Anjali Devi Chandran, Napa, CA
Erika Christianson, Bozeman, MT
Jann C. Clouse, Missoula, MT
Stanley B. Covington, Beijing, China
Michelle A. Cregger, Cheyeyah, WA
Carrie Jo Dagg, Fairfield, IL
Quinn Michael Daily, Carbondale, CO
Bonnie E. Daley, San Francisco, CA
Ann Dannenberg, Newtown, MA
Tracy Ann Dickerson, Corvallis, MT
Aaron Elings, Sandy, UT
Stacey M. Ellis, Polson, MT
Dawn Nicole Estrella, Union City, CA
Janet C. Fenker, San Jose, CA
Devin M. Flamm, Hardin, MT
Michael J. Flamm, Hardin, MT
Emily M. Ford, Bozey, VA
Dennis Fulkerson, Lisbon, IA
Joshua Gates, Wilmington, DE
Cheri Gerber, Kelowna, British Columbia
Tim Germeraad, Flossmoor, IL
Lisa C. Green, Boyce, VA
Paula J. Groenfeld, Harrisburg, SD
Jean Marie Honger, Savage, MT
Stephanie A. Hall, Rosebud, MT
Lisa Dawn Hart, Crested Butte, CO
Amy L. Haverland, Poesta, IA
Angie Hewitt, Bozeman, MT
Kathy Pickens Hirst, Ashland, MT
Seth A. Hodges, St. Michaels, AZ
Miranda Hollow, Chiloh, MT
Katie E. Hubbell, Naperville, IL
Deb L. Hughes, Andalusia, AL
Dora M. Hugs, Pryor, MT
Cheryl Hugs, Pryor, MT
Thomas A. Ippolito, Coatsville, PA
Cathy L. Jamison, Wake Forest, NC
Sara Elizabeth Jay, Bozeman, MT
Pamela Kaatz, Sechelt, British Columbia
Margaret Kane, Prescott, AZ
Renee Kelch, Ronan, MT
Bonnie J. Keller, Blacksburg, VA
Rose Kent, South Royalton, VT
Lorna Sue Lange, 29 Palms, CA
Erin K Lynch, Bozeman, MT
Mary L. Maier, Missoula, MT
Patrice Malamis, Rochester, IL
Dan Mcgee, Belt, MT
Amanda McGill, Clinton, MT
Stuart Miles, Asheville, NC
Tami A. Morrison, Polson, MT
Mary K. Osman, Newark, DE
Gerald Ott, Elveron, PA
Beth Peterson, Highland Park, IL
Alfred T. Poirier Jr., Dover, NH
Sarah S. Poletto, Naperville, IL
Anne Powers, Kingston, Ontario
Page-Marie Price, Lolo, MT
Holly Prull, Bend, OR
Tina L. Raeder van Stirum, Gonzales, CA
Nancy Farrington Reid, Natick, MA
Paul E. Robinson, Valhalla, NY
Susan R. Rolke, Rindge, NH
Melinda K. Rorschold, Parker, CO
Jeff Salter, Salt Lake City, UT
Scott Schafer, Weston, WI
Michael A. Schoenborn, Seattle, WA
Catherine Schuck, Missoula, MT
Debra Lea Schwake, Lodge Grass, MT
Justin L. Smith, Coatsville, PA
Karen M. Smith, Lame Deer, MT
Jennifer Stadum, Bozeman, MT
James Stuart, Bozeman, MT
Bryna Thomson, Dallas, TX
2010 Graduates - Continued

Bill Thornburgh, Carmel, IN  
Charlotte Waters, Vancouver, WA  
Michelle Weber, Dubuque, IA  
Nancy Wells, Saltsburg, PA  
Heide Westwood, Hardin, MT  
Sue White, Derby, KS  
Gail Whiteman, Bozeman, MT  
Deanna Rose Zerbe, Lodge Grass, MT

Emily McKenna, Belding, MI  
Margaret K. Magonigle, Hanna, HI  
Kathryn Madden, Beaufort, SC  
Karen L. Lund, Huntingdon, England  
Jac L. Lame, Colorado Springs, CO  
Shannon Knodel, Belgrade, MT  
Marty King, Legrand, IA  
Darren Kellerby, Anchorage, AK  
An'juli Johnson, Billings, MT  
Cheryl A. Hudson, Tifton, GA  
Daryl Allan Holst, Bangkok, Thailand  
Megan Hopkins, Naperville, IL  
Hadley Hentschel, Carbondale, CO  
Matthew J. Shargel, Walnut Creek, CA  
Christopher G. Monsour, Tiffin, OH  
Richard Montoya, Eureka, MT  
Erik Nickerson, Boulder, CO  
Cameron Novak, Fredericksburg, VA  
Aaron Olmanson, Golden Valley, MN  
Bradley Pederson, Belle Plaine, MN  
Timothy D. Percoski, Bloomfield, CT  
Janet E. Perry, Ashland, ME  
Alanna Piccillo, Palisade, CO  
Paul Pierre, Nassau, Bahamas  
Erin Quintia, Columbia Falls, MT  
Jonathan C. Reveal, Nashville, TN  
Mary Seabrok Ritter, Bethelham, PA  
Seth Robertson, Renton, WA  
Peter Rust, Wilmington, DE  
Robin Scardino, Hong Kong, China  
Jessica F. Schultz, Culdesac, ID  
Ralph E. Spraker, Jr., Columbia, SC  
Marcie Steen, Mount Vernon, OH  
Joyce Strichly, Terre Haute, IN  
Nancy Hoggard Tailey, Tarboro, NC  
Shaun Terry, LoveLock, NV  
Katherine Theobald, Alexandria, VA  
Marta Toran, Boone, NC  
Jeanne Torske, Broadus, MT  
Urata Ursita, Winston, OR  
Shari F. Ward, Ashland, ME  
Tom Wellnitz, Johns Creeks, GA  
Matthew Wigglesworth, Honolulu, HI  
Jennifer Williams, Honolulu, HI  
Andrea Gissing Yordan, Philadelphia, PA

2011 Graduates

Melanie S. Acker, Ulysses, PA  
Patti Rae Bartlett, Seeley Lake, MT  
Jennifer Moore Bernstein, Portland, OR  
Lindsay Paige Bower, Middleburg, VA  
Brennan Brockbank, Fairfax, CA  
Deborah Brown, Nyssa, OR  
Nancy Lee Bryant, Burlington, NC  
Deborah Brown, Nyssa, OR  
Brennan Brockbank, Fairfax, CA  
Jennifer Moore Bernstein, Portland, OR  
Michelle Hammond, Lake Worth, FL  
Jeremy Harder, Big Sky, MT  
Yvette Strandell Hart, Hastings, NE  
Annie Hesterman, Westminster, CO  
Raul Holzhafer, Orefield, PA  
Brandon Honzel, Missoula, MT  
Angie Hopwood, Superior, MT  
Laura Hovland, Bozeman, MT  
Jessica Hughes, Arlee, MT  
Douglas Martin Janezczko, Goshen, NY  
Jennifer Jones, Ogallala, NE  
Alan Kalt, Lexington, MA  
Mark Kellogg, Camdenton, MO  
Batya Kinsberg, Eaglewood, NJ  
Leah M. Knickerbocker, Bozeman, MT  
Karyn Ann Kretschmer, Genoa City, WI  
Charla Lake, Ronan, MT  
Mary Larson, Polson, MT  
Ann Leach, Leavenworth, WA  
Candice M. Lommen, Maple Valley, WA  
Hilary M. Lozar, Roman, MT  
Hermes Lynn, Livingston, MT  
Jill D. Mahoney, Fairfax, VA  
Sibley A. Malee-Ligas, Arlee, MT  
Kasey Marks, Missoula, MT  
Cara Marlowe, Dubai, United Arab Emirates  
Joy Mayer, Green Bay, WI  
Colleen Marie McDaniel, Houston, TX  
Miles McGeelhan, Manhattan, MT  
Randi Metzger, Orwigsburg, PA  
Robert Moyer, Birstol, PA  
Susannah Spraydlin Murphy, Frenchtown, MT  
Jennifer Narimatsu, Bremerton, WA  
Kimberley Orr, Lethbridge, Alberta  
Alisha Pablo, Hot Springs, MT  
April Peterson, North Bay, Ontario  
Sadie Peterson, Silver Springs, MD  
Melinda Reed, Florence, MT  
Marcie Reuer, Grande Cache, Alberta  
Joe M. Ruffatto, Great Falls, MT  
Mark Santarelli, New Fairfield, CT  
Michele Schaub, Crow Agency, MT  
Anne Farley Schoeffler, Hudson, OH  
Rachel Screnar, Bozeman, MT  
Matthew J. Shargel, Walnut Creek, CA
2012 Graduates - Continued
Jennifer Sherburn, Hesperia, MI
Aaron Shotts, Mechanicsburg, PA
Carolyn Slagle, East Helena, MT
LaCee Small, Ashland, MT
Dale Spady, Westlake Village, CA
Stephanie Statema, Park Ridge, IL
Lauren Stepho, Norfolk, VA
Lisa Russell Stevens, Crow Agency, MT
Reba K. Storm, Hardin, MT
Melissa Anne Sullivan, Carlsbad, CA
Clinton Swartz, Middleburg, PA
Robin Tillman, Cranbrook, Canada
Brandy L. Thrasher, Missoula, MT
Lizbeth A. Townsend, East Helena, MT
Molly Underwood, Redwood City, CA
Jay Walls, British Columbia, Canada
Tylene M. Walters, Manhattan, MT
Paula Wang, Poplar Island, MD
Lee Weldon, Missoula, MT
Rachel M. White, Belgrade, MT
Wendy D. Whitmer, Spokane, WA
Beth Workman, Bainbridge, OH
Rachel Lee Zupke, Seattle, WA

2013 Graduates
Georgia Alvarez, Vancouver, WA
Kelly Arnold, Clarksville, TN
Suzanna Barnhart, La Crosse, WI
David Bates, San Francisco, CA
Charles Benson, Bellevue, NE
John Bishel, Port Allegany, PA
Dana Blomquist, Spokane, WA
Andrew Bright, Gabrills, MD
Tina Brothers-Tillinger, Helena, MT
Jennifer Bruns, Juliaetta, ID
Joe Clark, Carson City, NV
Carrie Clement, Helena, MT
Judith Coats, Eldorado Del Mar, CA
Crystal Cornwell, Ronan, MT
Brooklyne Coulter, Strasburg, CO
Joe Crider, Helena, MT
Emily Currier, Helena, MT
Janeen Curtis, Darby, MT
Jennifer Curtis, Rockport, ME
James Davies, Ridgefield, WA
Caleb Dorsey, Loyalton, CA
Pamela Dresher, Culver City, CA
Amy Dushane, Yuba City, CA
Lori Egan, Thornton, CO
Holly Faris, Hamilton, MT
Laura Feldkamp, Wichita, KS
Tyler Ferebee, Pawnee City, NE
Jason George, Notus, ID
Dale Glass, Potomac, MD
James Glynn, Chicago, IL
Shannon Greco, Princeton, NJ
Lance Gerow, Riyadh, Saudi Arabia
Rachel Grey, Winnabro, LA
Taylor Green, Red Lion, PA
Michael Greenhoe, Kandersteg, Germany
Courtney Harrell, Peyton, CO
Michael Helseth, Yakima, WA
Robin Henrichs, Mc Cook, NE
Benjamin Heyde, British Columbia
Alice Hinck, Broadus, MT
Jennifer Hood, Dayton, TN
Jeanna Jasperson, Montrose, CO
Beverly Jaworski, Burtonsville, MD
Tamara Jendro, Helena, MT
Susan Johnson, Southbury, CT
Shari Juroszek, Bozeman, MT
Kevin Kenealy, Nevada, IA
Linda Kocian, Elk Grove Village, IL
Amanda Kozak, Ashland, OH
Scott Lannen, Phoenix, AZ
Robert Lee, Shelby, MT
Brett Lehner, APO, CA
Heather Leiberg, Helena, MT
Martha Lord, Hamilton, MT
Doug Lymer, Houston, TX
Dalton McCurdy, Fairfield, CT
Julie McDonnell, Oak Park IL
Heather McWhorter, Las Vegas, NV
Murry Metge, Great Falls, MT
Ashley Milbrandt, Helena, MT
Julie Morris, Peotone, IL
John Nilsen, Dhahran, Saudi Arabia
Julie McDonnell, Spring Creek, NV
Justo Crofutt, Pinedale, WY
Hank Davis, Asheville, NC
Coreen Ann Dingler, Lufkin, TX
Rebecca Love, Dobson Kinsman, OH
David Dooling Jr., Alamogordo, NM
Daniel DuBrow, Chicago, IL
Chance Duncan, Dardanelle, AR
Camilla Dusenberry, Helena, MT
Stephanie Fields, Ocean City, NJ
Shari Generaux, Oakland, CA
Elaine Gibbs, Valrico, FL
Sara Danielle, Groton Helena, MT
Lily Guajardo, Cedar Park, TX
Jacquelyn Haas, West Bend, WI
Jennifer Heisler, Kent, OH
Kyle Herdina, Winona, MN
Analea Hronke, Red Lodge, MT
Angie Jenkins, Independence, IA
Heidi Kirsten Jessen, Yuma, AZ
Christine Jones, Vancouver, WA
Alecia Jongeward, Bozeman, MT
Carisa E. Ketchen, Kalispell, MT
Andrea Robbins, Red Lodge, MT
Pablo Rojo, Brooksville, FL
Sally Sanders, Tallahassee, FL
Josie Sherrn, Bozeman, MT
Charles Shields, Greencastle, ID
Judith Silva, Franklin, ME
Michelle Slaughter, Lincoln, CA
Matthew Sloan, Glenview, IL
Adam Smith, Sioux Falls, SD
Charles Strobino, APO, Germany
Angela Swank, Livermore, CA
Chris Swiden, Watertown, SD
Sarah Tabor, Bozeman, MT
Kenneth Taylor, Bozeman, MT
Carol Teintze, Bozeman, MT
Jacob Thompson-Krug, Omaha, NE
Kristina Troke, Doral, FL
Dina Tucker, Austin, TX
Jennifer Vaughn, Houston, TX
Carrie Wagner, Medina, OH
Cindy Watson Pottebaum, Winterset, IA
Mary Ann Watt, Concord, NH
Irene Wilcox, Clearwater, MN
Danielle Wilczak, Clearwater, MN
Suzanne Wilson, Olympia, WA

2014 Graduates
Joshua Abernethy, Asheboro, NC
Deanna Bailey, Huntington, VT
Mariann Bernard, Escondido, CA
Marcia Blome, Omaha, NE
James P. Bratka, Gahanna, Ohio
Dean Brown, Medicine Hat, Alberta
Cameron Burns, Spokane, WA
Joshua Caditz, Carbondale, CA
Irene Catlin, Atlanta, GA
Matthew Clay, Webb City, MO
Kara Lee Coates, Spring Creek, NV
Justo Crofutt, Pinedale, WY
Hank Davis, Asheville, NC
Coreen Ann Dingler, Lufkin, TX
Rebecca Love, Dobson Kinsman, OH
David Dooling Jr., Alamogordo, NM
Daniel DuBrow, Chicago, IL
Chance Duncan, Dardanelle, AR
Camilla Dusenberry, Helena, MT
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Cindy Watson Pottebaum, Winterset, IA
Mary Ann Watt, Concord, NH
Irene Wilcox, Clearwater, MN
Danielle Wilczak, Clearwater, MN
Suzanne Wilson, Olympia, WA

Page 33
### 2014 Graduates — Continued

Logan D. Mannix, Helena, MT  
Krista Martens, West Glacier, MT  
Matthew McClellan, Lake Charles, LA  
Doralee McCormick, Cincinnati, OH  
Ashley McGrath, Helena, MT  
Casey S. McHugh, Missoula, MT  
Candace McMullan, Fishers, IN  
Dawn Mercer Turner, Huntsville, AL  
Mark H. Meredith, Dardanelle, AR  
Mary Mingels, Somerset, ME  
Heather Mitchell, Houlton, ME  
Stephen Mohr, Austintown, OH  
Jeffrey Noblejas, Oakland, CA  
Eric Todd Ojala, Lolo, MT  
Sherry Otruba, Roanoke, VA  
Kai Pokley, Port Austin, MI  
Michael Poser, Hobson, MT  
Lynn Powers, Bozeman, MT  
Katie Redmond, Chicago, IL  
Randy Zane Rowland, Sheridan, WY  
Pamela J. Schaefer, Lake Hiawatha, NJ  
Christina Anne Scott, Gold Bar, WA  
Kaylee Christine Shaw, Kalispell, MT  
Ahmed Shawli, Bozeman, MT  
Carol Lee Smith, Van Alstyne, TX  
Jennifer A Smith, Colorado Springs, CO  
Garold Sumner, River Falls, WI  
Michael H. Tang, Irvine, CA  
Melissa Thompson-Krug, Blue Eye, MO  
LeAnn Thongvanch, Des Moines, IA  
Rachel Tinkler, New Berlin, WI  
Donna Raquel Tully, Kanéohe, HI  
Jessica Radi Vasquez, Cedar Rapids, IA  
Christina L. Wallace, Thornfield, MO  
Jocelyn Wells, St. John, New Brunswick, CA  
Clinton Whitmer, Poplar, MT

### 2015 Graduates

Kellen Alger, Cut Bank, MT  
Jeremy Barcus, Corvallis, MT  
Carli Barnes, Vancouver, WA  
Daniel Betts, Bankok, Thailand  
Patricia Brandenburger, Walden, CO  
Jerald Brunt, Bozeman, MT  
Kyle Casper, New Stuyahok, AK  
Pamela Christianson, Great Falls, MT  
Kellie Clinger, Freedom, WY  
Kristin Combs, Victor, ID  
Michelle Davis, Saratoga Springs, UT  
Kisha Delain, Fridley, MN  
Alyx Demers, Idaho Falls, ID  
Emily Diaz-Chard, Vineland, NJ  
Gregory Dyk, Edgerton, MN  
Jennifer Edwards, Casper, WY  
Ritu Gandhi, Houston, TX  
Shifra Gassner, Bettendorf, IA  
Tassay Gillespie, Lebanon, OR  
Kelly Goodpaster, Fayetteville, AR  
Stephanie Guilmet, Blairstown, NJ  
Matthew Haack, Bear, DE  
Michael Haiderer, Saginaw, MI  
Lindsay Hall, San Francisco, CA  
Andrew Heller, Wautoma, WI  
Sharon Heyer, Forest Lake, MN  
Jennifer Hood, Dayton, TN  
Carrie Howell, Chattanooga, TN  
Jason Hults, Villisca, IA  
William Ilfif, Sacramento, CA  
Thomas Jurczak, Claremont, CA  
Kendra Kanduch, Phillipsburg, MT  
Jolene Kayser, Black Hawk, SD  
Leah Anne Key, Huntersville, NC  
Timothy Klavon, Pennsburg, PA  
Joshua Koo, Mount Prospect, IL  
Brooke Laundon, Brooklyn, NY  
Martha Lindemann, Manassas, VA  
Jennifer Markham, Franklin, MA  
Liane McGillen, Washington, DC  
Janine Melillo, Cortlandt manor, NY  
Stacey Mowchan, Newington, CT  
Joseph Muise, New Westminster, Canada  
Chrispus Mwapea, Houston, TX  
Carol Myers, Pensacola, FL  
Spencer Nedved, Vancouver, WA  
Thomas O’Leary, Eureka, MO  
Jake Otto, Colorado Springs, CO  
Dawn Peterson, Gricignano di Aversa, CE, Italy  
Mark Pfeifer, North Battlefield, SK, Canada  
Caryn Purcell, Ridgefield, CT  
Annie Reichelt, Idaho Falls, ID  
Heather Renyck, Olean, NY  
Brian Staggs, East Grand Rapids, MI  
Andrew Stattel, Chestnut Hill, MA  
Stephanie Stender, Sheridan, WY  
Jennifer Temple, Glendale, MT  
Johannes Thum, Ketchum, ID  
Jerald Touchstone, Eagle, ID  
Amelia Vandehey, Hillsboro, OR  
Adam VanZee, Bozeman, MT  
D. Matthew White, Cookeville, TN  
Lisa Williams, Fairfax, VA  
Stacey Zaback, Corvallis, OR
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Montana State University

18th Annual Symposium in Science Education

Bozeman, MT
July 5th - 9th, 2016
Reid Hall 101, 102, & 452

Master of Science in Science Education

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