RiSE Conference 2015: Teaching, Learning, and Assessment in the Context of the Next Generation Science Standards and the Common Core State Standards in Mathematics

Poster Session Abstracts

Ordered by Author's Last Name

Title: **Teachers Analyzing Teacher Responses as Part of a Professional Development to Promote Deeper Understanding**

Authors:

Carolina Alvarado, Postdoctoral Research Associate, RiSE Center, University of Maine
Michael Wittmann, Professor of Physics and Chair of the Department of Physics and Astronomy, and RiSE Center Faculty Member, University of Maine
Laura Millay, Research and Evaluation Coordinator, RiSE Center, University of Maine

Abstract: The Maine Physical Science Partnership (NSF #0962805) is a professional development program for K-12 science teachers. We analyzed a cohort meeting were teachers analyzed their own responses to a set of four open-ended questions from previous years regarding a specific energy scenario. We observed changes in their conceptual understanding and the way they analyzed the data. Teachers moved from an evaluative mindset, focusing on the flaws of the responses or missing parts in the responses, towards the recognition of the resources shown in each response. By combining two responses they created their own refined answer for the question evaluated. We observed that while evaluating their colleagues' responses they detached the person from the answer but when they were recognizing the valuable resources they recognized the person behind the idea. We observed that the discussion of teachers' answers with other teachers allows for development of content knowledge.

Title: **Teacher Professional Development Using Iterative Inquiry Based Chemistry Activities**

Authors:

Clint Eaton, Master of Science in Teaching Graduate Student, University of Maine
Stephanie Virgilio, Master of Science in Teaching Graduate Student, University of Maine
Mitchell R. M. Bruce, Associate Professor of Chemistry, and RiSE Center Faculty Member, University of Maine
Somnath Sinha, Postdoctoral Research Associate, RiSE Center, University of Maine
Laura A. Millay, Research and Evaluation Coordinator, RiSE Center, University of Maine

Abstract: Maine Physical Sciences Partnership (Maine PSP) is a National Science Foundation project led by the RiSE (Research in STEM Education) Center at the University of Maine to reform and vertically align science education in rural school districts. This partnership caters to the needs of the science teaching community by providing professional development on topics of interest/need to the teachers resulting in a unique level of teacher ownership in their own development as leaders and professional educators. With regards to that, there was a week-long chemistry workshop for teachers with the goal of enhancing knowledge of scientific inquiry and instructional practices among middle school

chemistry teachers. The purpose of this study was to assess the impact of inquiry based chemical activities on teacher's understanding of scientific inquiry. Data sources such as surveys, posters, clicker questions, and interviews were collected prior, during, and at the end of the PD workshop. Findings showing evidence of improvement of scientific communication thorough iterative poster creation and inquiry understanding are presented in this poster. Implications and further research directions are also discussed.

Title: **Exploring What Students Understand about the Syntactic and Epistemic Function of Reasoning in Argumentation**

Author: Grace Gonnella, Master of Science in Teaching Graduate Student, University of Maine

Abstract: My project explores what students understand about the role and effect of explicit reasoning in an argument. The study was conducted with 10 pairs of 6th grade students at a local middle school. The students were interviewed and asked to answer questions in an activity packet. The main activity in the packet was a contrast matrix, which was specifically designed and refined to promote the understanding of the role and effect of reasoning in an argument. My research focuses on what students learned about reasoning. Preliminary analysis of the 10 pairs of student interviews show that students learn the syntactic and epistemic functions of reasoning in an argument.

Title: **Understanding the Learning That Takes Place during GeMS Synthesis Modeling**

Author: Derek LaBarron, Master of Science in Teaching Graduate Student, University of Maine

Abstract: My research is within the GeMS project which stands for (Generalization with Model Synthesis). My specific topic for my thesis is to determine what kind of information the students are learning as they undergo a unit about desert formation with a focus on modeling through synthesis. Synthesis modeling is when a student takes multiple models and uses them to try to create a new model that includes the critical processes of the multiple starting models. By having the students create a generalized model in this manner it forces them to look beyond the surface features of models that may be completely different in appearance but have the same core structure and idea. The students were part of a special 2 week unit where they are taught about desert formation and modelling with a focus on synthesis. After they have taken evaluations they are then asked to participate in a think-aloud in which I ask them 3 questions they have seen before and one slightly different question. I then compared their answers on the think-aloud with what they wrote on paper to make sure we are getting an accurate measurement of what they learned and that what they know is translating to the answers on paper. This is the basic premise of my research, discovering what kind of learning takes place when using a specialized instructional method.

Title: **Does Productive Talk Improve Students' Abilities to Use Evidence to Support Claims in Their Written Work?: A Pilot Study**

Author: Rachel Martin, Master of Science in Teaching Student, University of Maine

Abstract: High-quality scientific writing makes use of argumentation to support ideas and, often, it is the sharing of ideas that makes an argument stronger. Productive talk is intended to facilitate a rich discussion that enables students to better share their ideas. Approximately 80 ninth graders from a central Maine high school answered two questions from their MainePSP Global Climate Change Instructional Resources1 curriculum. For the first question, the students provided their answers with no discussion beforehand. For

the second question, classrooms were divided into three discussion protocols—no discussion, discussion with Talk Moves2, and discussion without Talk Moves. The students were instructed to answer the questions using a Claim-Evidence-Reasoning (CER) Framework that is already being emphasized in the classroom. The written responses are being analyzed using a CER rubric designed for this specific project to determine differences between the arguments provided for the first and second questions. This serves as a pilot study for a larger study in the upcoming fall. I am seeking interested teachers to participate in rubric design, scoring validation, question selection, and classroom data collection.

1 Adapted from EarthComm, Second Edition, ©2012.

Title: **Using EarthComm's Geolog Style of Teaching**

Author: John McKechnie, Science Teacher, Ellsworth High School

Abstract: The poster will describe the teaching style of the Earthcomm text and show how easy and effective it is to use with other subjects. Ellsworth HIgh School has shifted their 9th grade focus from primarily an Earth Science Curriculum to that of a Physics First approach. The teachers continued to use the Earthcomm style when developing the sequence. It has proved to be an effective method for teaching and learning with some similarities to a traditional KWL approach.

Title: **Investigations at the Intersection of Symmetry and Problem Solving**

Authors:

Meredith Muller, Master of Science in Teaching Graduate Student, University of Maine

Eric Pandiscio, Associate Professor in Mathematics Education, and RiSE Center Faculty Member, University of Maine

Abstract: Symmetric ability is a student's proficiency in imagining, mentally visualizing, manipulating, and comparing objects under reflection and rotation. I hypothesize that this is a distinct sub-ability of spatial reasoning and that it is more accessible to students due to the inherent cultural sense of balance in symmetrical objects. Symmetry in problem solving is an efficient heuristic, but underutilized and not taught explicitly. For this study I have developed an instrument to measure symmetric ability and will use interviews to investigate students' use and preference for symmetric arguments in problem solving. This poster discusses the background and method of this ongoing project.

Title: **Next Steps Learning**

Author: Anita Stewart McCafferty, Assistant Professor, Educational Leadership, University of Southern Maine

Abstract: Examples/models of Next Step learning strategies for improving student outcomes will be shared.

Title: **Calculus Students' Ability to Interpret Slope and Derivative**

Author: Jen Tyne, Lecturer, Department of Mathematics and Statistics, and Master of Science in Teaching Graduate Student, University of Maine

Abstract: Studies have shown that students have difficulty with the concepts of slope and derivative, especially in the case of real-life contexts. Success at higher-level mathematics depends on a deep understanding of rate, though students often bring their impoverished views of slope and rate of change to calculus, thus hindering their ability to understand derivatives and continuously changing rates. Following up from a previous study, clinical interviews of students in second semester calculus were conducted. The goal of the interviews was to gain more understanding on the nature of students' difficulties with slope and derivative. Thirteen students answered questions about linear and nonlinear relationships and interpretations of slope and derivative, explaining their thought process and reasoning. They also critiqued the reasoning and accuracy of a hypothetical person's predictions. Results indicate that many students struggle interpreting the meaning of slope, using a ratio-of-total approach (implying that slope is yx) instead of the ratio-of-changes ($\Delta y \Delta x$). Subsequently, many of these students go on to interpret the derivative in a similar manner, incorrectly using the derivative at a point to approximate a y-value by calculating $f(x)=f'(x)*x$.

Title: **Place-Based Education in the Maine Physical Sciences Partnership (MainePSP) Ninth Grade Global Climate Change Instructional Resources[1]**

Authors: Marina Van der Eb, Master of Science in Teaching Graduate Student, University of Maine

Abstract: Place-based education works to use local environmental and cultural occurrences as a basis for student learning. Smith (2002) states that the goal of place-based education "is to ground learning in local phenomena and students' lived experience." This method of teaching has been proven to increase student learning achievement and appreciation for the natural world and their community (Sobel, 2004). This study is looking at the incorporation of a place-based lesson into ninth grade science classrooms to determine its impact on students' attitudes towards science. A group of researchers and ninth grade teachers worked together to design a lesson targeting a ninth grade science standard in the context of the Maine lobster industry. This lesson was incorporated into the geolog worksheets normally used in the curriculum, and created to fit within designated time constraints. Five teachers piloted this lesson during the spring semester. Classes completing the place-based lesson were observed and video recorded. Students were also asked to respond to pre- and post-attitude surveys targeting their interests in science and in Maine. This poster shows preliminary results from these five teachers' classrooms.

[1]Adapted from EarthComm, Second Edition, ©2012

Smith, G. A. (2002). Place-Based Education: Learning to Be Where We Are. Phi Delta Kappan 83.8: 584. Canadian Periodicals Index Quarterly.

Sobel, D. (2004). Place-based education: Connecting classroom and community. Nature and Listening, 4.

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Lauren Driscoll, Hermon High School
Jeff Gordon, Katahdin High School
Teri Jergenson, Bucksport High School
John McKechnie, Ellsworth High School
Dale Nealey, Belfast Area High School

Title: **Students' Understanding of Middle School SEPUP Chemistry Curriculum**

Authors:

Stephanie Virgilio, Master of Science in Teaching Graduate Student, University of Maine

Clint Eaton, Master of Science in Teaching Graduate Student, University of Maine

Mitchell R. M. Bruce, Associate Professor of Chemistry, and RiSE Center Faculty Member, University of Maine

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Abstract: Maine Physical Sciences Partnership (Maine PSP) is a National Science Foundation project led by the RiSE (Research in STEM Education) Center at the University of Maine to reform and vertically align science education in rural school districts. This partnership caters to the needs of the science teaching community by providing professional development on topics of interest/need to the teachers resulting in a unique level of teacher ownership in their own development as leaders and professional educators. With regards to that, there was a week-long chemistry workshop for teachers with the goal of enhancing knowledge of scientific inquiry and instructional practices among middle school chemistry teachers. Following a discussion with the teachers participating during the workshop and their feedback, a survey was developed to align with the Science Education for Public Understanding Program (SEPUP) Chemistry curriculum. The purpose of this survey was to study the students' understanding of major Chemistry concepts and their misconceptions. This survey was administered to 7th and 8th grade students before and after the classroom instruction. Findings showed significant learning gains across multiple chemistry concepts, but also identified several persistent misconceptions. For example one question targeted the law of conservation of matter, which resulted in 52% of the students answering with the correct response post instruction with a learning gain of 28%, but there was still over a third of the student population selecting a response that reflects a common misconception. Implications and further research directions are also discussed.