



STEM partners

Statewide initiatives build a community of educators to enhance student learning and engagement

NOW IN its sixth year, the Maine Physical Science Partnership (MainePSP), as well as its companion program, the Maine Elementary Science Partnership (MaineESP), both based at the University of Maine, are being recognized for their success. Their work in promoting research-guided science instruction to students, from early childhood through ninth grade, impacted the STEM learning experience of more than 20,000 children statewide in the past year.

In October, the Maine Science Teachers Association awarded the MaineESP the 2015 Philip Marcoux Award. The award recognizes a science education professional or partnership that makes continuous and enduring contributions to science education; demonstrates capacity for creating and implementing successful science education-related activities; shows creative approaches to improving student achievement in science; and makes a permanent contribution to the Maine Science Teachers Association by integrating with national initiatives, promoting the science education profession, or providing training and resources to other science education professionals.

Earlier this summer, the National Science Foundation awarded the MainePSP a supplemental grant of more than \$2 million, a follow-up award to the \$12.3 million grant to the university's Maine Center for Research in STEM Education (RiSE) — funding which was used to create the partnership. The new funding will be used to improve science and mathematics teacher recruitment, preparation and retention in Maine by involving experienced classroom teachers in preservice teacher preparation in order to bridge the gap between theory and practice.

“Both the MainePSP and the MaineESP support teachers to bring high-quality instructional resources and research-

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MainePSP materials engage students in **solving engineering problems** that provide **real-world context and improved retention** for science and math concepts.” Mickie Flores

supported pedagogy to their science classes, increasing student learning and engagement. These two programs also give Maine districts an unprecedented opportunity to build a coherent, vertically aligned science curriculum for their students, as part of a community with similar goals,” says Dr. Susan McKay, principal investigator of the MainePSP and MaineESP, UMaine professor of physics and director of the RiSE Center.

THE RiSE Center has established innovative partnerships between university faculty and preK–12 science teachers, creating a diverse learning community of educators discussing and demonstrating best practices in science edu-

cation. Initially, the MainePSP program focused on students in grades six through nine, a time when many students lose interest in science. It also focused on improving teaching and learning in science, mathematics and engineering at the University of Maine.

The Schoodic Institute, the Maine Mathematics and Science Alliance, and the Institute for Broadening Participation also have been part of this partnership.

The program has used a collaborative task force approach, with middle school and high school teachers working with UMaine faculty and graduate students to review potential instructional materials informed by the latest science education research.

The research drives innovations in the classroom that, in turn, generate new research that drives additional innovations.

The partnership has selected a common set of instructional resources recommended by the task force, along with materials for each science unit. That provides a more interactive, hands-on science learning experience that results in more engagement for both the student and the teacher.



In the past year, the Maine Physical Science and Elementary Science Partnerships **impacted the STEM learning of more than 20,000 children statewide.**

THE EARLY successes of the MainePSP approach drew interest among elementary school teachers and curriculum coordinators, who asked for a similar type of support for science education in the lower grades. Elementary teachers generally teach multiple subjects and their classroom needs were different. So, backed by a Maine Department of Education grant, RiSE created the MaineESP. The new partnership adapted the “train-the-trainer” model to leverage the innovative model of teacher leadership to share professional development in school districts across the state.

The MaineESP currently works with teachers in more than 100 partner schools in more than 50 Maine school districts. Science resource partners are selected from each of the partnering schools to join a statewide professional learning community with STEM and STEM education faculty from the university. Partners receive preparation and support to lead study groups in their schools about research-supported and innovative instructional strategies for science teaching.

Now in its third year, the program provides ongoing professional development for more than 1,000 teachers statewide.

“The development of practical ways to extend the reach of UMaine to teachers throughout the state is a major accomplishment of our partnerships. Using science resource partners, well-prepared through high-quality, ongoing professional development, as a link between RiSE and their districts is a strategy that is invaluable in a rural state such as ours. We are studying this approach closely to understand how to continue improving its effectiveness,” McKay says.

Although it is still early to provide definitive statistics

on the program’s success, early indications show that MainePSP students have scored higher on state standardized tests than their statewide counterparts, and the number of MainePSP students that have not met state standards is shrinking. Surveys also indicate that those successes have affected student and teacher attitudes toward the science classroom. More students have indicated that they consider themselves good or very good science students.

Teachers have said that they have strengthened their science knowledge as a result of participating in the partnership, and the majority has indicated that they consider themselves better science teachers. Among their comments:

Mickie Flores, the 2015 Hancock County Teacher of the Year and one of eight semifinalists for Maine State Teacher of the Year, teaches sixth and eighth grade at the Deer Isle-Stonington Elementary School. **THE ADVANTAGE OF NETWORKING:** My desire was for my students and me to become part of a larger network because of our geographic isolation, and also to share in the most current STEM education practices. This is the third year I have employed Project-based Inquiry Science (PBIS) in my eighth-grade classroom and the second year with the Science Education for Public Understanding Project (SEPUP) in my sixth-grade classroom. Not only are the resources thoroughly engaging, we also have appreciated visits by the UMaine Master of Science in Teaching students, joining us as teaching partners. **ENGINEERING SOLUTIONS:** MainePSP materials engage students in solving engineering problems that provide real-world context and improved retention for science and math concepts. MainePSP keeps me current as an educator

and provides a phenomenal network for my classroom and me. I’m not on an educational island anymore.

Bill McWeeny uses the SEPUP: Earth Science materials with his fifth- and sixth-grade classes at the Adams School in Castine. He spreads the program over two years, adding other science curricula, including oceanography, botany and Newtonian physics, among others. **INSPIRATION:** I find working with colleagues inspiring. I like to bounce ideas off people, compare strategies and hear about others’ successes. The MainePSP was a no-brainer for me when I heard about all the meetings that allowed these kinds of exchanges. As a bonus, we also received wonderful training in content area. Absolutely a win-win situation. The MainePSP is the best professional development I have taken part in in 20 years. **IMPROVING TEACHING:** I think college professors and outside researchers working with teachers to improve classroom experiences is a great mix. The MainePSP atmosphere is a wide variety of professionals working together to improve things. I think it is the best way to make progress in improving teacher skills. In addition to having access to great activity-based curricula, every month I get new ideas from talking with the colleagues at the MainePSP and now the MaineESP. This program inspires me to be a better teacher and gives me the confidence that I can.

Lori Matthews teaches eighth-grade physical science at the Reeds Brook Middle School in Hampden. **ENGAGED LEARNING:** As a biology-based major in college who ended up teaching physical science, I was always open both to better understanding of the content, as well as to improving instruction of topics, such as force and motion, energy and chemistry. The other strength that I could see from this grant was that we would be working with university professors who were interested in this same topic. I have been teaching an engineering/design unit, a force and motion unit, a chemistry unit and an energy unit with my eighth-grade classes for several years now. The students have asked and answered the most amazing questions. They are engaged in activities that all tie together toward a common challenge, and they have design and engineering practices woven throughout the curriculum. **MAKING A DIFFERENCE:** We

should never underestimate the power of a group of dedicated teachers who want to do their best for their students. It doesn’t matter that we are from rural Maine, that we might be the only science teacher in our school or that we are teaching four other subjects besides science. We can make a difference in how science is taught and learned in Maine, especially if we are provided with a great platform like the MainePSP or MaineESP. The MainePSP has been a tremendous gift for my students and me. **THE FUTURE:** By having a common curriculum in our area of the state, students have the benefit of the research and data that I have been able to access from the UMaine team that has impacted my teaching. A strong network of teachers in a rural area through technology has made me and my students feel the strength of a partnership. I often share with them what their counterparts are learning and discovering in other classrooms throughout the partnership as a way of extending their borders. The strong leadership in the MainePSP has also supplied opportunities for teacher leadership that are not always available in rural districts. This is important for the future of science teaching and learning in Maine.

Melissa Lewis teaches seventh-grade science at J.A. Leonard Middle School in Old Town. **TALKING STEM:** As a new teacher in 2012, I began attending collaborative meetings with the MainePSP because I was interested in having conversations with other science teachers about the way they teach science. After the first meeting, I felt that I had found a community of science educators that I could relate to and that I felt were going to lead a change in science education in our state. In my second year of teaching (2012–13), I piloted the SEPUP: Issues and Earth Science program in my seventh-grade classroom. I used these materials for two years in my classroom and students love this program. **CONNECTED:** The classroom culture has changed, with increased focus on empowering students to take ownership of their learning. The program connects them to real-world issues in science and society, so they feel more connected. I am better at teaching the content, encouraging my students to use scientific practices and assessing their learning so they can expand their thinking, and feel more confident as scientists and decision makers. ■