search (EPSCoR). Faculty and graduate students collaborate with EPSCoR staff on research projects, and UBMS students work with them as part of their Group Design Projects, according to Colannino. “This past summer, two UBMS student groups designed portable touch tanks utilizing wagons that a professor could use to transport aquaculture to local schools. Another group helped a professor who researches land development along the Penobsot Watershed make his work more accessible by creating a mobile app based on his website,” she explains.

After their papers are reviewed by peers and staff, they are published in A Journal of Explorations, the UBMS in-house publication. The professors and graduate students build on the students’ work in their research, Colannino notes.

For their Individual Research Projects, students are mentored by UBMS staff, university faculty, or graduate students, says Colannino. This summer’s students produced papers on topics such as Cellular Mechanisms of Chemotherapy-Induced Cognitive Impairment and Cellulose Nanofibers in the Synthesis of Bioplastics.

The students presented their papers during a poster session at the university’s annual STEM Symposium. Their work was then published in A Journal of Explorations, according to Kelly Ilseman, UBMS assistant director, who coordinates the academic components of the program.

To help UBMS students with their summer projects, the program requires them to take two courses: Scientific Writing and Experimental Design and Statistics. The latter is “probably our hardest course because many of the students haven’t had statistics courses before,” Colannino contends.

Sophisticated STEM
Steve Stevenoski and James Madsen strive to ensure that both Upward Bound students at the University of Wisconsin-River Falls (UWRF) and those who teach them have a quality STEM learning experience for 10 days each summer. “I enjoy doing science with at-risk students because they think about things in ways that are different,” asserts Stevenoski, a science teacher at Lincoln High School in Wisconsin Rapids who serves as lead instructor for the STEM portion of UWRF’s Upward Bound program.

Madsen, who chairs UWRF’s physics department, and Stevenoski are connecting the Upward Bound students and teachers with IceCube, a particle physics experiment at the South Pole. Because the science, math, and engineering of IceCube are sophisticated and complicated, Madsen—who is also associate director of the IceCube Collaboration and responsible for its education and outreach program—says he and Stevenoski use the IceCube project as “an approach, rather than a prescription,” for teaching STEM.

“We go from things that are concrete to ‘abstract’ ideas in astrophysics,” he explains. “We help [the teachers] develop confidence in explaining how science works...They craft it into something that is palatable [for the students].” The teachers “get to use their creativity to choose activities they’re familiar with, or they can try new things without [dealing with] the deadline pressure of the school year,” he relates.

“We go from building a paper tower to understanding what kind of engineering is needed to build a drill to melt a hole in the ice (black hole),” says Stevenoski. He and Madsen help the teachers employ what they call “a narrative arc”: introducing basic STEM concepts through hands-on engineering activities, then gradually increasing the complexity of the activities so students can grasp how what they’re doing relates to the work of the IceCube scientists.

To accomplish this, Stevenoski says teachers need to believe “every one of our kids is a gifted kid. They are bright kids from a disadvantaged environment...They don’t need remediation; they need acceleration.”