Budzban, Eames, and Voepel discuss math education


This week on Segue, Greg Budzban, PhD, dean of the Southern Illinois University Edwardsville College of Arts and Sciences, hosts Tammy Voepel, PhD, and Cheryl Eames, PhD, both faculty members from the Department of Mathematics. With a conversation based on the evolution of mathematics education and pedagogy, Budzban and his fellow mathematicians discuss a recent four-year National Science Foundation (NSF) grant received by the College, aimed to transition secondary education away from current "right or wrong answer" teaching assessments, toward a more hierarchical learning progression of teaching and assessment.

"This is an exciting time in mathematics education, because some dormant ideas, such as how we teach, the curriculum we use and the assessments we provide, are starting to come out again," says Budzban. "People are starting to understand things such as simple multiple choice tests and traditional mathematics curricula aren't reaching the students we need to reach."

Discussion begins with Eames explaining the concept of learning progression and its application in mathematics education. Eames explains that learning progressions are: "The levels of thinking children progress through on their way to understanding mathematical topics."

"We're looking for the levels of thinking in each student, and watching for each level of thinking to develop into a more sophisticated level of thinking until that student has reached a certain mathematical goal," Eames shares.

She continues with imagery, allowing listeners to envision a classroom that harnesses the full capabilities of these new teaching strategies.

"If you walked into such a classroom, something quite different that you'd see is accessible instructional tasks being posed to children at a range of levels, because diversity in a classroom is expected," Eames explains. "Children would be seen engaging with the tasks at different levels, and each of those levels would come out during discussion.

"A child's response to that task wouldn't be assessed with, 'That's right,' or, 'That's wrong.' Rather, it would be determined, 'This student is level 2. This student is level 3. This student is level 4.' Educators would think about what support is needed next to help that child move to subsequent levels.

"So many of us are dissatisfied with the large-scale, multiple choice assessments currently used, because they don't fully assess a student's knowledge. This grant will hopefully produce some finer-grained tools and assessments that are trajectory-based and learning progression-based."

As multiple choice testing is quite rare in higher education mathematics, Budzban believes the need for learning progressions in science, technology, engineering and mathematics (STEM) education must become prioritized in pedagogical development.

"In mathematics, we know this is the direction we need to go," he says. "The types of questions we give at the university level are complex questions that students must be prepared for. I'm glad to see that both the NSF and the Educational Testing Service are interested."

The grant's initiative will be further supported by Voepel's rich contacts in the St. Louis Metropolitan and Metro East area school districts. As the Math Educators of the Greater St. Louis Area university representative, as well as a founding member of the Great Rivers Math Teachers' Circle, Voepel has provided the region with a resource for educational professional development, and has created a valuable network of teachers and school districts to assist in the grant's research studies. Through these interactions, coupled with the support of the Educational Testing Service, SIUE's learning progression research has potential to make broad, national impact in secondary education technique.

Researchers will also engage in cognitive interviews, studying students through one-on-one conversations to analyze what they are saying, writing and gesturing, to gain a better sense of understanding on each child's unique way of thinking and learning. With this information, the researchers will develop learning progression models that more generally describe the thinking and educational growth of students.

Through this grant, Budzban also plans to heighten professional development opportunities for local school districts.

"With the PARCC Exam, I feel part of that issue was the teachers never truly had the professional development they needed to reason through those differences in assessments, or the pedagogy required to teach in this new way," he explains. "A critical piece of this grant is reaching out to the area's schools and helping teachers. Those teachers realize a lot of the traditional curriculum is not reaching students, and they're hungry for new ways to teach and assess their students.

"In my year of working here, community outreach has been extremely important, and I've become quite proud of how we work with the local school districts."

While much has been done to develop the grant and further the research opportunities for learning progressions, the mathematicians explain that there is still much to be done – the movement has only just started. Because so little is known about learning theory and learning progressions and so many unanswered questions remain on the topic, this grant-funded project has great opportunity for continued future research.

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By Logan Cameron, SIUE Marketing & Communications