Lucy H. Michal, Ph. D.

[lmichal@epcc.edu](mailto:lmichal@epcc.edu)

Research in mathematics education is filled with proven strategies of what, how, and when to use innovated curriculum, strategies and pedagogy to get more students to complete courses and programs of study. Colleges using guided pathways, mathematics pathways, new curriculum and redefined structures have more students completing required mathematics courses and programs of study in less time. However, what about students in courses where faculty do not use innovative curriculum, strategies and pedagogy? What strategies can faculty use to give students equitable learning experiences? How does what faculty believe about learning mathematics impact effective learning experiences for students?

I designed and conducted a study to see the connections between teacher knowledge and teaching of two-year college mathematics faculty. Using mixed methods, sequential, nested, and multi-case design for a study, I measured content knowledge, mindset for learning, and ability to identify lesson objectives, to investigate the connections between these three variables and teaching of two-year college mathematics faculty. The main objective of the study was to explore connections between content knowledge, mindset for learning mathematics, ability to identify lesson objectives, and teaching.

The current global pandemic turned our classrooms into interesting manifestations of a new normal, and while the study was conducted before the current Pandemic, the findings are relevant for designing and providing faculty professional development and considering additional criteria when hiring new faculty.

Part one of the study was quantitative and was initiated by administering two surveys to a random sample of two-year college mathematics faculty. The surveys provided data on participant teaching experience, demographics, profile measures of their mindset for learning (Yeager and Dweck, 2012) and content knowledge in six mathematical domains: Number and Operation; Patterns and Algebraic Reasoning; Functions and Graphs; Geometry and Measure; Probability and Statistics; and Mathematical Processes .

Part two of the study was qualitative and was administered to a nested subset of participants from the random sample in part one. It measured the ability to identify lesson objective(s) after viewing a video of a lesson. In part three, the quantitative and qualitative measures from the first two parts of the study provided a way to select a purposive sample representing four faculty typologies. Participants were selected to represent faculty with: 1) high content knowledge scores and high profiles in growth mindset for learning, 2) high content knowledge scores and low profiles in growth mindset for learning, 3) low content knowledge scores and high profiles in growth mindset for learning, and 4) low content knowledge scores and low profiles in growth mindset for learning. Teaching observations and interviews provided additional qualitative data.

A key finding showed faculty with a knowledge of mathematics as a discipline, coupled with a high growth mindset profile engaged students in activities developing meaningful and productive learning of mathematics. Data also reported a statistically significant relationship between content knowledge and lesson objectivization (Pearson’s r = o.6148, p < 0.05). Specifically, faculty who saw mathematics as a discipline for learning rather than a collection of courses students needed to take before taking another course, provided students with activities that engaged them in a community of learners nurturing student learning and the learning of other learners. Faculty provided students with learning mathematics and immediate applications of mathematics and its meaningful use while students were engaged in learning mathematics and engaged others. Because faculty play an important role in creating activities where students are agents of their learning and belong to a community while learning mathematics it is important faculty view teaching mathematics with meaningful activities. Determining how faculty view mathematics (as a discipline of study and or just as a list of courses to teach) may, if added to selection criteria, provide rich information when hiring candidates for faculty positions.

Faculty demonstrated limited knowledge of the science of learning (Sawyer, 2006).

Additionally, faculty was familiar with growth mindset and its impact on learning, however, few identified it as something they needed for teaching. Content knowledge measures varied by domain. Faculty were stronger in algebraic topics than in probability and statistics. With the need for more faculty to teach mathematics pathways statistics courses, this alerted us of the need for designing faculty professional development to strengthen knowledge and pedagogy in probability and statistics and professional development focused on the learning sciences.

Article:<https://www.chronicle.com/article/What-Does-It-Mean-to-Support/249052?cid=wcontentlist_hp_latest>

Resources

Sawyer, R. K. (2006). The New Science of Learning. In R. K. Sawyer (Ed.), *The Cambridge Handbook of The Learning Sciences* (pp. 1-16). Cambridge University Press.

Schoenfeld, A. (2016). Research in Mathematics Education, *Review of Research in Education, March 2016, Vol. 40*, pp. 497 – 528. DOI: 10.3102/0091732X16658650.

Yeager, S. D. & Dweck, C. S. (2012). Mindsets that promote resilience: When students believe that personal characteristics can be developed. *Educational Psychologist, 47*(4), 302- 314.