
Pathways to Program Improvement

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If you think transformation is linear, you'll live to be disappointed. – Gary Martin

Members of the Mathematics Teacher Education Partnership (MTE-P) who have begun work on the complex challenge of program transformation were invited to share their experiences around these efforts. This panel gets to the heart of MTE-P. At its inception, MTE-P always had a transformation goal – increase the supply of secondary mathematics teachers as well as the quality of both our programs and the future teachers we produce. The Research Action Clusters (RACs) were meant to help with that work. But in order to truly transform, each program must draw upon the work of multiple RACs together and integrate what is learned from the RACs into our programs. Enduring and meaningful change is often slow change. Who's available to do the work? What's the priority for improvement? What kind of institutional support do we have?

Now that the RACs have established a foundation, MTE-P is ready to address what it means to transform. What does transformation look like? MTE-P's proposed strategy is to support teams as they create strategic pathways for their local programs. No one model will work for everyone, but might a framework be created with the flexibility to be useful in diverse local contexts? MTE-P is committed to building the capacity and infrastructure needed to help partnerships transform and improve their programs. This panel sets up the work of a new working group – Transformations – and establishes a foundation for their work. The panelists were asked to address the following questions:

- What is the status of your team with respect to overall transformation of secondary mathematics teacher preparation?

- Where are the opportunities for making progress towards that goal?
- What are the challenges in making progress towards that goal?
- What might MTE-P do to support your progress?

The responses of each panelist to these questions follows below, with concluding statements from the Reactant, Robin Hill.

Mark Ellis – California State University Fullerton

California State University at Fullerton (CSUF) is part of the 22-campus teacher preparation network of the CSU system, which also comprises the CSU MTE-P team. CSUF has a rich local context within the partnership. The local work they've done has helped in a bidirectional sense – they have been able to secure additional funding and then use that funding (e.g., Bechtel Foundation) to develop more partnerships and collaborations. Through this work, they have been able to envision teacher preparation development as a continuum over time instead of isolated incidences of learning. Through the Bechtel grant, CSUF developed a shared vision within their own institution and in partnership with two local school districts. That development of a shared vision allowed for more explicit conversations across the local partnership, especially focused on what does a well-prepared teacher look like and how can that be supported so that learning for *all* K12 students can be supported.

During this time, the campus was bringing in new mathematics education faculty within the Colleges of Natural Sciences & Mathematics and Education. The new faculty were easily able to talk about elements of the transformed mathematics teacher preparation program (e.g., co-plan/co-teach); they became “normalized” conversations. The modes of collaboration and conversations were the norm among the new faculty, experienced mathematicians and mathematics educators, and school district partners. Having new Deans in both colleges at the start of the 2016-17 academic year aided in solidifying the program transformation as they understood the transformed program as something that was typical.

One set of challenges everyone has faced involves time: the time for planning; the time for implementing; the time for collecting data about the implementation; and the analysis of the data and revisions to that the model. For example, Plan-Do-Study-Act cycles take time. Another challenge was the time required for long-time faculty to embrace the transformed program as the new normal.

Having the support of the statewide network of the 22-campus CSU team has helped address the challenge of time, through persistence and visibility. The CSU system is now a go-to partner across the state because of their involvement in MTE-P. In fact, they were successful in advocating the addition of 16 mathematics-specific items to a statewide teacher exit survey

that will allow faculty to look deeper into their programs using data both locally and across institutions.

Much can be learned from not only the work at CSUF, but also across the CSU team. California is an exceptionally diverse state, so context is especially important and matters. Among the insights gained from conversations across the 22-campus network was the realization that some campus credential programs did not require content specialists to do supervision of teacher candidates. When this surfaced in survey generated by the CSU MTE-P team, it provided faculty with substantive data to bring to local campus administrators to advocate for program changes. Collectively, it's essential that program quality should not be affected by different contexts.

Margaret Mohr-Schroeder – University of Kentucky

The current status of teacher preparation in the Commonwealth of Kentucky is a little chaotic and unstable. There is a dire need for middle and secondary mathematics teachers across the Commonwealth; both the urban and rural regions are struggling to get qualified teachers into classrooms and staying in those classrooms. Even alternative certification programs such as Teach for America have not solved these two issues of recruitment and retention of mathematics teachers. As a result, mathematics educators from across the Commonwealth have come together, on their own accord, to discuss how to collectively solve the challenges facing mathematics teacher preparation. One key challenge is that there is little state support for thinking about teacher preparation differently; for looking at teacher credentialing differently.

Recruitment into teacher preparation programs remains a fundamental issue, especially because the high school graduating population is decreasing across the state. A majority of the public institutions have had to recruit students from out of state, which poses different recruiting challenges than from within the state. Many of the programs have undergone radical transformation over the past five years. For example, Western Kentucky University and Morehead State University are official UTeach replication sites. University of Louisville and the University of Kentucky both added undergraduate certification programs when their 5th year/MAT programs began to struggle with numbers.

The Commonwealth also has a dramatically changing policy landscape. While the new governor is promoting STEM, the promotion is at the community college level. Meanwhile, there have been deep cuts, including mid-year cuts, to institutes of higher education. Furthermore, pending litigation regarding many education-related issues and the promotion of private education over public education make transformation difficult and tumultuous.

The retention of teachers, not just in the first five years, but especially between years 10 – 15 is an unprecedented problem. Experienced teachers are leaving the classroom because

their job has become unfulfilling. As they leave public education, they seek out different ways to reach people; they still wish make an impact. One example is the loss of teachers to manufacturing companies. These companies realize the great knowledge and pedagogical skills of secondary mathematics teachers, so they recruit and entice teachers to leave the profession to come and deliver professional development to their workers. They offer higher salaries, a more flexible work schedule, benefits even if you work part time, and all the resources and tools they need to deliver the training to the adult learners.

Yet the biggest challenge in Kentucky is that teachers are seen as a problem in the state.

Despite the challenges in education facing Kentucky, there have been ample opportunities for transformation and impact, many of which are due to the MTE-P. The current focus on the MATH and STRIDES RACs are important. Although many Kentucky mathematics teacher preparation programs have transformed programs, they now need to attract more students and must focus on specific induction structures to retain them after they've graduated.

Specifically, at the University of Kentucky (UK), there has been institutional transformation. Through the involvement in Science and Mathematics Teacher Imperative (SMTI) and MTE-P and going through the SMTI analytical framework, UK identified the need to create a STEM niche. So, they created a Department of STEM Education which helped to pave the way for the new undergraduate program in which a student earns a double major in STEM education and mathematics (or whatever content area they will be teaching).

Through this transformation, UK learned that institutional transformation evolves slowly and is hard work. Partnerships must take a deep look at their programs and institution and often throw out preconceived notions of what something should look like or how it should function. But looking at things this way is how you can dramatically change what you're doing.

Moving forward, the broader STEM community in Kentucky is working on developing a statewide STEM education center. Although transformations are happening across the state, there is no backbone structure to help pull it together. A center would help to scale transformations across institutions, leverage resources, collect and analyze common data, and generally just help support each other as change agents.

There are many challenges in Kentucky moving forward. Being a highly-regulated state in terms of teacher preparation is one of the most challenging issues. There are three separate governing agencies for teacher preparation programs – the state department of education, the teacher certification agency, and the higher education governing agency. There are many times regulations are implemented often without thinking about the impact on teacher education programs, including structures not directly related to the regulations. For example, the teacher certification agency recently released a regulation that all middle and secondary teachers had

to take a content area literacy course. On the surface this does not appear to be a bad idea. But a deeper analysis of the regulation reveals that instead of thinking about ways to integrate those ideas into current coursework and teach it in context, the regulation requires a new course taught by an accredited literacy faculty member. The result? The creation of an isolated course that has no field experience component and had to be squeezed into an already credit-heavy STEM major. Moreover, the number of hours for an undergraduate program are fixed—so the result is not merely adding a course, but now a course must be removed.

As the Kentucky partnership continues its transformation endeavors, MTE-P will be able to help think about scaling beyond local change; the expansion of partnerships is important. Local change is great, but how do you get beyond local change? How do you scale that really great idea that has made an impact? What does scaling even look like? How do we, together, better advocate for our teachers?

DeVonne Smalls – Richland County School District One, South Carolina

The University of South Carolina (UofSC) partnership faces many challenges, including secondary mathematics teacher shortages, poor teacher retention, and declining high school enrollment. The biggest obstacle in the UofSC partnership is filling all of their mathematics teaching positions needed by schools and districts in our state. Local schools too often begin the school year hiring long term subs.

While preservice teachers at UofSC have fantastic teacher placements, that's not always their reality when they get hired at their own schools. Through a new summer induction program, the UofSC partnership is trying to introduce them to these potential challenges and provide more support mechanisms early in their career.

Within the UofSC partnership, enrollment levels at the local high schools continue to trend downward. This has especially affected the ability of schools to offer specialized mathematics courses. While there is a desire to offer these courses, the low student population will not support them. Further, teachers and district personnel across the partnership struggle to find time to meet and take action around the challenges such as the inability to sustain specialized mathematics course. The UofSC partnership is hoping that expanding the partnership to include more K12 schools might help leverage resources and aid in recruiting new teachers.

MTE-P has been a great support for the UofSC partnership. There have been several opportunities within the partnership to help meet the goals of MTE-P and their local partnership. UofSC plans to add a capstone course that helps to tie the education coursework more effectively to the mathematics major. The opportunities provided to network with and share resources with other partnerships and to learn from the work of various RACs has been extremely helpful. Additionally, valuable resources (e.g., MCOP², Recruitment Guide) have been

a great help in making partnership transformations. As the UofSC partnership looks to the future, they would like to see the development and offering of cross-institutional courses.

Wendy Smith – University of Nebraska Lincoln

Sometimes tinkering is what you need. Sometimes going all in is what you need. – Wendy Smith

The University of Nebraska-Lincoln (UNL) has gone through five years of institutional change. They started off tinkering with small ideas, but found that strategy ineffective. Instead, they needed bigger changes to what they were doing—so they decided to go “all in,” with bringing active learning into their first-year mathematics courses.

Two-thirds of UNL freshmen take a mathematics course in their first semester; no other department gets close to seeing that many freshmen. Spurred by an administrative emphasis on graduation and retention rates, the mathematics department took a deeper look at their local and benchmark data. Unsurprisingly, they found that mathematics grades correlated very highly with retention and 5-year graduation rates. Their pass rates in the mathematics courses ranged from 40% - 70%, depending on the instructor. They also noticed that students passed Calculus I at higher rates when they took it right out of high school compared to when they took College Algebra at UNL prior to Calculus I. Wanting to get ahead of any top-down changes, the mathematics department decided to implement “active learning,” first in their College Algebra courses. They targeted these high-enrollment courses because they would have a more dramatic effect on retention from freshman to sophomore year and the courses were generally taught by graduate teaching assistants (GTAs) and adjuncts (e.g., very short institutional memory). In order to help prepare the GTAs for teaching the courses with this new pedagogical approach, the mathematics department started requiring them to take a teaching course. Surprisingly, the department only had to sell the change the first year; thereafter, they didn’t have to sell it at all. The mindset was already established and normalized, “This is how we do it. This is just how you do it when you’re at UNL.”

Early efforts aided in the dramatic transformation: common syllabi, common exams, and common grading all helped pave the way for the change. There was already a mathematics resource center for tutoring. While tinkering generally didn’t work, what really paved the way as a new department chair who vocally advocated for active learning for *all* mathematics courses.

While there were lots of strategies (see Figure 1) that aided in the transformation, a key to the sustained change was the First-Year Mathematics Faculty Taskforce. The taskforce was there to help review elements of the active learning transformation, for example, to make sure the content was still at an appropriately challenging level. The taskforce reviewed exams and determined the new exams were actually more rigorous with active learning than they had been previously.

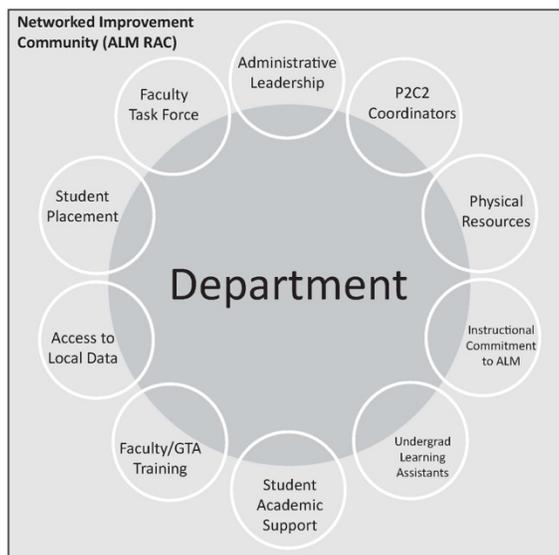


Figure 1. Elements of a common vision for effective mathematics instruction at UNL.

There are still challenges that must be faced within this transformation process at UNL. Issues remain with student placement into courses. Access to local student data is still unresolved, particularly for data needed to compare programs at UNL to those of peer institutions.

The keys to the transformation success were many, but overall, when you raise the expectations for the students, you have to raise the level of support so students can meet these expectations. Part of that support at UNL was the implementation of learning assistants. Another part was physical resources. UNL renovated classrooms to include movable oval tables and chairs, as well as white boards that went all the way around the room. Additionally, the mathematics department was able to convince the university that Active Learning was more like a physics lab than a traditional lecture class, so now instructors have more minutes for the same number of credit hours. This allows students the extra time needed to help support and provide an environment that fosters deeper conversations. Finally, a new position for Director of First Year Mathematics was created.

College Algebra and Calculus I courses have been transformed. Calculus 2 is next and Business Calculus is down the road. Through this dramatic transformation in the pedagogy of the first-year mathematics courses and within the mathematics department, failure rates have been cut in half. Having the local and national data really helped to bring the faculty on board.

Robin Hill – Kentucky Department of Education; President of Association of State Supervisors of Mathematics

Each of these four examples indicate the need and opportunity to partner with your state agencies in the transformation process. State agencies can help to work strategically, bringing additional people to the table and helping to influence policy. Bringing the right people together in your partnerships can be the key to success. Connections with state agencies will strengthen both partnership teams and the RACs. If you're not talking to the right people, then it's difficult to enact change.

For implementing transformation, MTE-P provides a tremendous opportunity. The examples given here today are evidence that there really is and can be institutional change. Getting people to work together and to buy into the change is key. Some tips for transformation include:

1. Don't oversimplify everything. Everyone might not see things as we see it. Be intentional about your partnerships and being intentional and what roles each member plays.
2. Make sure you're clear and transparent about what happens. Transformation doesn't happen miraculously or instantaneously.
3. There will be a "Dawn of Reasoning"; the realization that certain efforts are going nowhere. Pushing on the right drivers as well as sharing the load and the information (see #2) can make your efforts smoother. Partnering with state departments of education can really help here.
4. Realize that you're not in this alone.

Transformation is complicated, a little messy and hard work. Some of the efforts may at times like you're herding cats. Managing the complexity of many moving parts and partnerships to transform your programs may seem endless and sluggish. There will be some scratches, bumps and bruises along the way. But this work is worth doing because it's going to lead to stronger mathematics teachers. This goal that is sought is shared by the hundreds of individual members of the MTE-P, and broadly by so many more.