The MTEP 2.0 Network: The Journey to Transform Secondary Mathematics Teacher Preparation Continues

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The Mathematics Teacher Education Partnership (MTE-Partnership) is a coalition of mathematics teacher preparation programs launched in 2012 to improve secondary mathematics teacher preparation using the networked improvement community (NIC) design (Bryk, 2020; Bryk et al., 2015). With the release of the Association of Mathematics Teacher Educators’ (2017) Standards for the Preparation of Teachers of Mathematics (AMTE Standards), the MTE-Partnership pivoted to focus on meeting the vision for mathematics teacher preparation presented in that document, noting that meeting that vision is often challenging: “Those involved in mathematics teacher preparation must be committed to improving their effectiveness in preparing future teachers of mathematics” (AMTE, 2017, p. 2). In particular, “faculty in programs preparing teachers of mathematics must build collaborations with faculty in other programs preparing teachers of mathematics. Learning from and with colleagues from other institutions and providers can accelerate progress in their improvement efforts, with faculty benefitting from experiences and results of each site” (AMTE, 2017, p. 166). The NIC design is an effective way of organizing such collaborations, as demonstrated by the progress of the MTE-Partnership Research Action Clusters (RACs) in addressing significant problems of practice (Martin et al., 2020). However, a further adaptation was introduced in 2020 with the launch of the “MTEP 2.0” network, which refocused the NIC model on guiding local program improvement work as well as cross-institutional work (Franz et al., 2020). The 2021 conference marked the 10th annual convening of the MTE-Partnership and was explicitly designed to accelerate the development of the MTEP 2.0 network. This chapter describes the initial design and launch of the MTEP 2.0 network, as well as the resources provided to further support the development of the local program NICs through the conference and other avenues.

The Design of MTEP 2.0

During the initial years of the MTE-Partnership, the focus was on establishing the MTE-Partnership as a NIC, following four essential characteristics (Bryk et al., 2015):

- **Focused on a well-specified common aim:** An improvement aim expresses “lofty goals and specifies operational targets” (Bryk et al., 2015, p. 150). It serves to provide both focus across the NIC on actions that promote movement to the aim and as a motivation for members so they feel part of a common narrative.

- **Guided by a deep understanding of the problem space and the underlying system:** Improvements seek to achieve sustainability by first understanding the root causes (systemic factors) of the identified problem of practice, and then determining change levers and associated strategies for moving those
levers. The levers for change are sometimes called change drivers; NICs typically create a driver diagram to map their planned changes and relationships among hypothesized change drivers (Bryk et al., 2015).

- **Disciplined by the rigor of improvement science**: The use of evidence to guide the development of interventions ensures that the changes being proposed are actually improvements. Plan-Do-Study-Act (PDSA) cycles are used to iteratively prototype, test, and refine interventions; use of PDSA cycles has the potential to lead to timely solutions to important problems (Bryk et al., 2015).

- **Networked to accelerate progress**: Rather than trying to control variation, as typical in traditional educational research, the NIC design embraces variation to study how interventions need to be adapted to respond to the differing conditions under which they are used. As they are tested and refined, interventions can be gradually spread across the network, supporting scale up (Bryk et al., 2015). Further note that the structure of the network allows a divide-and-conquer approach in which subsets of membership can address different problem areas in parallel.

The MTE-Partnership’s early driver diagrams led to the organization of RACs, each focused on one of four primary drivers: clinical experiences, active learning, mathematics content courses, novice teacher induction, and program recruitment and retention (Martin & Gobstein, 2018). This cross-institutional focus led to productive collaborations and significant progress in these areas (Franz et al., 2020).

However, the MTE-Partnership leaders came to realize that while cross-institutional collaborations in RACs were flourishing, the focus was not always on supporting local mathematics teacher preparation programs in making the necessary improvement to meet the ATME Standards (2017). Thus, MTEP 2.0 was launched in 2020 with a renewed focus on local teams’ transformation efforts and on associated MTE-Partnership-wide research to understand how the MTE-Partnership was supporting local transformation efforts (Franz et al., 2020). MTEP 2.0 is structured as a NIC-of-NICs in which local programs organize as NICs working toward locally defined aims related to program transformation, along with cross-NIC efforts including existing and emerging RACs focusing on common problems of practice. The overarching MTEP 2.0 NIC-of-NICs provides the hub structures to share knowledge across local program NICs, while also providing support and resources to those NICs. The local NICs have a variety of sizes and structures, from a single university-based teacher preparation program and one local school-district partner, to entire university systems with both local and state-level school and community partners.

The MTE-Partnership leaders developed the following aim for the MTEP 2.0 network:

> By 2025, 65 MTEP 2.0 programs (including 11 under-resourced institutions and/or minority-serving institutions) will be actively engaged in an explicit, localized, prioritized improvement process toward alignment with the AMTE Standards and MTEP (2020) Guiding Principles in order to increase the number of well-prepared beginning secondary mathematics teachers, foregrounding issues of equity and access both in the objectives and practices of the programs.

The leaders further developed the primary drivers outlined in Figure 1 to guide the work of the NIC-of-NICs. The work of program transformation is complex; driver diagrams help focus stakeholders’ efforts while avoiding seemingly endless tangents that can distract from progress toward the NIC aim.
Figure 1. MTE-Partnership 2.0 primary drivers, as of July 2021.

The Launch of MTEP 2.0

At the 2020 MTE-Partnership Conference, local program teams were initiated in a process of organizing their work following the NIC model (Franz et al., 2020), with final applications to join the MTEP 2.0 network due October 15, 2020. Each MTEP 2.0 NIC has developed (and in most cases refined) an aim and driver diagram to guide its efforts. Aims and drivers necessarily require periodic updates as progress is made, local contexts and policies shift, and stakeholders turn over. MTEP 2.0 NICs also had completed at least one PDSA cycle by the application deadline, with the expectation that they complete at least one additional cycle each semester thereafter.

In alignment with NIC structures, MTEP 2.0 established data collection procedures that allow it to learn from the work of its partners, with an “aim to learn what works, for whom, and under what set of conditions” (Bryk et al., 2017, p. 172) as progress is made to transform toward the AMTE Standards (2017). To that end, the collection of reports that include local NICs’ driver diagram revisions, PDSA cycles, data on program growth, and other records of local NIC progress occurs annually. Analysis of this data allows the MTE-Partnership to consider variation across contexts in the work of program improvement and then share results with members. The MTE-Partnership has established OpenCanvas as both a data collection point and a knowledge management system, where members can share information and find resources for program improvement. This report explores the initial findings in two major areas: establishing partnerships and priorities for the improvement work.

Establishing Partnerships

MTEP 2.0 emphasizes the importance of including stakeholders, especially those groups outside of the local institution, in the design of the local NICs. This emphasis directly aligns with AMTE standard P.1: An effective mathematics teacher education program has significant input from all appropriate stakeholders (AMTE, 2017). During the MTE-Partnership annual conference in 2020, NICs were provided time to engage in a root cause analysis specifically to brainstorm the stakeholders who needed to be part of the NIC work that would result in program transformation.

Currently, MTEP 2.0 consists of 19 partnership teams from 17 states, including 44 programs, with 12 teams having at least one member from a land-grant institution, and eight teams counting a minority-serving
institution in their membership; the partnership teams collectively prepare over 600 future mathematics teachers annually. MTEP 2.0 requires all NICs to have K–12 representation. Analysis of the annual team reports reveals Partnerships ($n=7$) as a recurring keyword. NICs continue to remake their team as they recognize key stakeholders that will help them meet their aim.

**Priorities for Improvement**

From the NICs that applied to be part of MTEP 2.0 ($n=19$), the aims and driver diagrams reveal that all but one explicitly focus on improving diversity ($n=10$) and/or equity ($n=11$) in their teacher preparation program. In line with the overall MTE-Partnership aim to increase the quantity of well-prepared mathematics teachers, the most common driver across MTEP 2.0 NICs is related to recruitment into teacher preparation programs ($n=14$). A quarter to a third of the MTEP 2.0 NICs have drivers related to forming a shared vision among stakeholders ($n=7$) or strengthening or expanding their partnership with their stakeholders ($n=5$) as discussed in the previous section, restructuring their preparation program ($n=6$), retention through the preparation programs ($n=5$), and aligning their programs with the AMTE Standards (2017) ($n=6$). Table 1 shows major categories of change drivers along with wording of representative drivers from MTEP 2.0 driver diagrams.

**Table 1**

*MTEP 2.0 Summary of 19 NIC Driver Diagrams*

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>N</th>
<th>EXAMPLE DRIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment</td>
<td>14</td>
<td>Understand how to connect with community college students who are future teachers of mathematics.</td>
</tr>
<tr>
<td>Diversity</td>
<td>10</td>
<td>Develop strategies to effectively recruit diverse candidates in the categories of incoming freshman, transfer students, and undeclared students and expand our recruitment efforts to include our K–12 partners.</td>
</tr>
<tr>
<td>Equity</td>
<td>11</td>
<td>Be more intentional about infusing equity throughout all K–12 partnership activities, university coursework, and clinical experiences.</td>
</tr>
<tr>
<td>Shared vision</td>
<td>7</td>
<td>Develop shared vision of good mathematics teaching and for the purpose of mathematics education across stakeholders.</td>
</tr>
<tr>
<td>Institutional structure</td>
<td>6</td>
<td>Find creative ways to expand the scope and length of the clinical experience.</td>
</tr>
<tr>
<td>Aligning to AMTE Standards</td>
<td>6</td>
<td>Establish a coherent system of content, pedagogy, and field experiences (e.g., courses) aligned with the AMTE Standards.</td>
</tr>
<tr>
<td>Effective teaching</td>
<td>6</td>
<td>Math teacher educators will learn about best practices and then promote/teach these best practices with pre- &amp; in-service teachers.</td>
</tr>
<tr>
<td>Retention</td>
<td>5</td>
<td>Ensure our incoming students are prepared for Calculus I in their first semester. (Retention)</td>
</tr>
<tr>
<td>Partnerships</td>
<td>5</td>
<td>Develop effective partnerships (within and across institutions, stakeholders) to support mathematics teacher preparation.</td>
</tr>
<tr>
<td>Policy</td>
<td>5</td>
<td>Research and advocate for policy changes that show potential for increasing diversity in the workforce.</td>
</tr>
</tbody>
</table>

Supporting the MTEP 2.0 Network

Since the MTEP 2.0 network was officially launched in Fall 2020, significant efforts have been initiated by the MTEP 2.0 NIC-of-NICs to support the local teams in their use of the NIC model to guide their improvement efforts. To begin, the 2021 MTE-Partnership Conference, a three-day event held in June, had a central focus on accelerating the teams’ progress. Then, a pre-conference was held in conjunction with the AMTE Annual Conference in February 2022. Finally, this report describes continuing support offered throughout the year.

2021 MTE-Partnership Conference

The conference was held virtually due to limitations in travel faced at most institutions involved with MTEP 2.0. Four working sessions were held across the first two days of the session; sessions focusing on the RACs were held on the third day. Each of the working sessions focused on a different aspect of how to initiate and support program transformation and, by design, had a primary focus on facilitating interactions across the members of the MTEP 2.0 teams in alignment with the networked characteristics of the NIC model. In addition, the MTEP 2.0 members were encouraged to collaborate in time provided between sessions. Overviews of the sessions follow.

- **Developing leadership capacity for local change.** Participants engaged in reading about and discussing characteristics of effective leaders, and then engaging in a round of discussions about local program NIC leaders. Participants were encouraged to add ongoing team-building to their driver diagram and PDSA cycles.

- **Cross-NIC collaboration to accelerate transformation efforts.** Teams participated in constructive listening and feedback small group sessions in which they described a PDSA cycle and sought feedback on next steps to continue growth. These structured discussions promoted sharing across program NICs to generate collaboration across institutions.

- **Navigating policy issues to support program transformation.** A panel of administrators from both K–12 and higher education discussed their take on how policy impacts secondary mathematics teacher preparation. Teams then met in breakout rooms to discuss issues facing their programs, followed by responses from the panel. A final breakout session focused on potential opportunities and solutions, with final responses from the panel.

- **Foregrounding equity and social justice in program transformation.** In this session, teams reflected on the value of maintaining an equity lens on local transformation efforts in secondary mathematics teacher preparation. They were introduced to two frameworks useful in this enterprise: A Racial Justice in Education framework (National Education Association, 2021) to provide deeper insight into transformation in secondary math teacher preparation and the Four Frames for Systemic Change framework (Reinholz & Apkarian, 2018) to better understand local transformation efforts.

This proceedings was developed to provide additional information that could not be directly provided during the conference due to the schedule limitations imposed by its virtual format. Two types of papers were
invited: (a) brief reports documenting program NIC or RAC progress in a PDSA cycle or related transformation work to make progress toward your aims, or (b) research papers reporting on more formal research conducted related to the MTE-Partnership’s overall aim and guiding principles.

**2021 AMTE Pre-conference**

A one-day virtual meeting was held prior to the AMTE Annual Meeting in February 2022. Two sets of breakout sessions were held. The first set of breakouts focused on the NIC model and was differentiated by level of interest and involvement in MTEP 2.0, including: (a) a session designed for those already engaged in MTEP 2.0 to help them develop leadership skills for change; (b) a session designed for those aware of and interested in pursuing an application to MTEP 2.0 on behalf of their institution; and (c) a session for those not familiar with MTEP 2.0 to provide them an overview of the NIC design. A second set of breakout sessions focused on particular areas of challenge in secondary mathematics teacher preparation, including recruiting and retaining diverse mathematics teacher candidates; promoting equitable practices in secondary mathematics teacher preparation; partnerships to support program transformation in secondary mathematics teacher preparation; and policy and institutional structures to support program transformation. As was the case with the MTE-Partnership Conference, significant opportunities for sharing across contexts was provided in all sessions. Note that a pre-conference also is planned to be held prior to the AMTE Annual Meeting in February 2023.

**Continuing Supports**

A variety of additional supports are provided by the MTEP 2.0 NIC-of-NICs. Perhaps most visible are monthly NIC-Casts, interactive webinars that provide opportunities for local NICs to engage with one another around improvement science ideas. These webinars are recorded and stored in OpenCanvas and therefore available as a resource for local NICs and as data for learning about program improvement. This structure allows smaller local NICs to pool data, leveraging collaboration to support informed decision making toward improvement. In addition, each team has been assigned a coach from the MTEP 2.0 planning team with whom they can interact throughout the year.

**MTEP 2.0: The Whole Is Greater Than the Sum of the Parts**

When the MTE-Partnership NIC was initially built in 2012, many of the leadership team felt that the power of the NIC was that they would be able to address problems of practice needed to improve their local programs. Moreover, use of the positive peer pressure resulting from examples of how other MTE-Partnership institutional members were going through similar transformations and how they had the support of their administrators to make similar changes emerged as powerful change levers across the MTE-Partnership NICs. As leaders have worked together in the RACs and other subgroups, they realized that the NIC is powerful in multiple ways—some of which we had not anticipated. Also, leaders are beginning to realize the power of the NIC model in guiding local transformation efforts in concert with global, cross-institutional collaborations. These researchers have found it essential that a culture of improvement propagates across those working to prepare teachers of mathematics, not only in the immediate contexts in which they work but also as a global, shared commitment of improvement. Despite its 10-year history, in some sense the MTE-Partnership journey is just beginning as it continues to seek ways to better support program improvement efforts. The leadership team aims to continue to contribute to the broader improvement journey of mathematics teacher preparation and to learn from others who join them in this journey.

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References


