Scaling the Impact of a Networked Improvement Community: Five Strategies from the Better Math Teaching Network

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AUTHORED BY

Jennifer Iriti
Jennifer Zoltners Sherer
Jennifer Lin Russell
Rosemary McNelis
Christopher Matthis

Partners for Network Improvement
Research, Strategy, & Evaluation

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Partners for Network Improvement

Research, Strategy, & Evaluation

Partners for Network Improvement (PNI) is a research and evaluation group based at the University of Pittsburgh's Learning Research and Development Center. Led by Jennifer Russell, one of the key developers of the Network Improvement Community Development Framework, PNI both leads networks and supports network leaders in their work to design, implement, and adapt improvement networks. Developmental evaluation is one tool PNI uses to help network leaders develop strong improvement networks.

Developmental Evaluation

Although industries such as healthcare have used improvement science for decades, the use of improvement science and networked improvement communities is relatively new in education. Because this work is complex and innovative, and because improvement science by nature requires rapid tests of change, adaptation to context, and systems thinking, the Nellie Mae Education Foundation invested in an intensive developmental evaluation of the Better Math Teaching Network (BMTN). PNI conducted a developmental evaluation that studied and supported the networked improvement community's (NIC) initiation, development, outcomes, and dissemination of lessons learned.

PNI's developmental evaluation of BMTN aimed to:

- Infuse an evidence-based critical friend/thought partner perspective into the network development process
- Track growth and the development of the NIC as a learning organization
- Produce useable knowledge for the education field and specifically for other educators, policymakers, funders, and researchers interested in the NIC model as a way to organize for improvement and address high-leverage practical problems
- Advance the evaluation field by testing and refining models for evaluating improvement processes and NICs in education contexts

Acknowledgements

We would like to thank the BMTN hub leaders and the 62 teachers who opened their practice and their learning spaces, and welcomed us in. We are inspired by their love of math, passion for students, and desire to never stop improving.

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The Better Math Teaching Network

From 2016 to 2021, the Better Math Teaching Network (BMTN) aimed to transform high school mathematics teaching in New England. Researchers and teachers worked together to make high school Algebra I classes more student centered. Launched by researchers at the American Institutes for Research (AIR), with support from the Nellie Mae Education Foundation (NMEF), the network was grounded in the following five core principles:

1. **Teachers are central to change.** Teachers shape students' learning experiences and beliefs about math. It is possible to create classrooms that are more strongly student centered—classrooms in which all students are actively and meaningfully engaged in learning math.
2. **Student-centered teaching is complex and almost impossible to do in isolation.** Teaching to maximize student engagement and understanding is complex. One way to deal with this complexity is for teachers to participate in structured, collaborative learning with other teachers and researchers.
3. **Teaching can be continuously improved.** Teaching is a craft to continuously hone. Teachers use practices daily that lend themselves to ongoing, incremental improvement. Continuous improvement methods from industry and healthcare hold promise for education.
4. **Quick-cycle improvement methods provide opportunities to study and improve teaching.** Many of the practices teachers want to improve on can be studied with quick-cycle research and development methods. Teachers can test and refine strategies within and across lessons, realizing improvements every few weeks, rather than waiting until summer break.
5. **Research and practice should be seamlessly integrated.** Too often, research and practice fail to inform each other. The BMTN included researchers and practitioners who worked arm-in-arm to test and refine improvement strategies in real classroom settings. Mutual respect fueled the work.

Network leaders, referred to as the network hub, organized the BMTN as a networked improvement community (NIC) to address a common problem of practice using improvement science. They drew on research to define three principles for Deep Engagement in Algebra (DEA), which anchored teachers' work as they strove to make their practice more student centered:

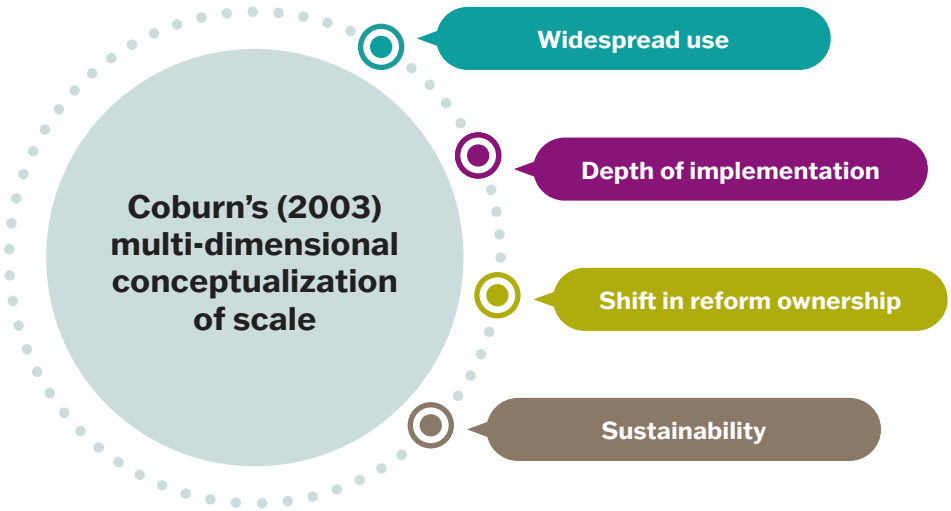
- **Connect:** Make connections among mathematical procedures, concepts, and application to real-world contexts, where appropriate.
- **Justify:** Communicate and justify mathematical thinking as well as critique the reasoning of others.
- **Solve:** Make sense of and solve challenging problems that extend beyond rote application of procedures.

The BMTN was piloted with a group of nine teachers during the 2015–2016 school year and added teachers the following three years. In all, a total of 63 teachers engaged in the BMTN. Selected from a pool of volunteers that applied to join the network, participating teachers worked in urban, suburban, and rural contexts and taught at least one Algebra I course to 9th grade students. They engaged collaboratively to continuously improve their teaching, enhancing learning for thousands of high school math students throughout New England.

Building a Networked Improvement Community

Inspired by the networked improvement community (NIC) concept (Bryk, Gomez, Grunow, & LeMahieu, 2015), researchers at the American Institutes for Research (AIR) launched the Better Math Teaching Network (BMTN) to address the problem of high rates of high school students disengaged from mathematics learning. Teachers in the BMTN employed improvement science methods such as the Plan-Do-Study-Act (PDSA) cycle to test student-centered routines that could result in deep engagement in algebra.

In the fall of 2016, the Nellie Mae Education Foundation (NMEF) funded Partners for Network Improvement (PNI) to launch a developmental evaluation. The goal of the evaluation was to provide timely and actionable information to network leaders—the BMTN hub—and members, which would allow them to accelerate their capacity to meet the network's aim. As the BMTN matured, the focus of the developmental evaluation shifted from studying the establishment of network operations and development to understanding how the network was organized to spread its learning and design for sustainability. PNI drew on a range of data sources[1] and Cynthia Coburn's (2003)[2] conceptualization of scale to understand and present five strategies for scale that the BMTN employed.



1 See Appendix: Data Collection.

2 Coburn, C. E. (2003). Rethinking scale: Moving beyond numbers to deep and lasting change. *Educational Researcher, 32*(6), pp 3–12.

Amplifying the Impact of Networked Improvement Communities

Networked improvement communities are designed to bring together educators who accelerate progress toward a shared improvement aim by engaging in systematic collaborative inquiry. As a network matures, network hubs often grapple with ways to scale and sustain the work to realize the NIC's potential.

One approach network hubs take toward achieving scale is to support the spread of the network's learning, processes, and/or resources beyond network participants. Given the design of the BMTN—63 teachers working in 44 different schools across all six New England states—the network could not expect to directly influence math achievement schoolwide. Therefore, the BMTN hub sought to amplify the impact of the network by sharing what it was learning in a variety of ways aimed at reaching educators beyond the 63 participating teachers.

Efforts to scale are dependent on the maturity and efficacy of a network's knowledge management and consolidation of learning functions—these are the mechanisms by which knowledge from iterative, individual tests of change are organized, curated, and validated. Thus, a network's efforts to scale can be enabled or constrained by the quality and quantity of the knowledge management and consolidation of learning functions. This also means that what will be meaningful and feasible to share from network efforts will be developmental in nature. That is, as the work of the network matures, the form and content of what is shared will also evolve.

The NIC model for improvement in education has been in use explicitly for a little more than a decade. NICs are temporary organizations, typically dependent on finite funding streams. In some cases, NICs are funded long enough to build tools and routines that enable the network's learning to be shared beyond the network. Our understanding of this process is still emergent. As an instructionally focused NIC, the BMTN provides a powerful case to explore approaches to scaling network learning. Lessons learned from this case might be instructive to other NICs as they mature.

Five Strategies for Scaling BMTN Learning

As the BMTN matured, different strategies for sharing network learning emerged. These strategies became more formalized and intentional as BMTN members developed tools and routines to spread the learning. Our multi-year evaluation sought to understand the affordances and constraints of each strategy. In the sections below, we present the five strategies that reflect this developmental trajectory.

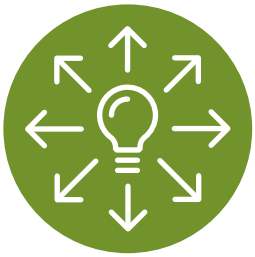
We begin by providing examples of each strategy. We then identify the resources necessary for implementation and reflect on the affordances and constraints of the strategy. To understand the possibilities for scaling the learning of the BMTN—and other improvement networks—we analyze each strategy using Coburn's four dimensions of scale: widespread use, depth of implementation, shift in reform ownership, and sustainability.

Strategy #1
Informal sharing with colleagues

Strategy #2
Formal presentations at conferences

Strategy #3
Dissemination through website and newsletter

Strategy #4
Hub-led spin-off communities



Strategy #5
Member spread in home contexts

Informal Sharing with Colleagues

The first strategy that emerged in the BMTN was **informal sharing**. From very early on in their work, participating teachers shared what they were learning in the BMTN with colleagues in their own professional networks. This included a range of spontaneous or organic exchanges (such as hallway conversations with school-based colleagues and mentioning aspects of the BMTN work in departmental or faculty meetings).

Examples

- BMTN teacher shares student-centered classroom change idea with school colleagues during math department meeting
- BMTN teacher shares student-centered change idea with math colleague and asks if he wants to try it out with her

Strategy Description

Hub resources needed

- None

Additional resources needed

- Teacher experience, own strategies, tools

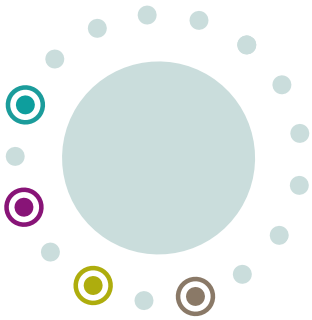
Affordances

- Capitalizes on existing relationships
- Can seed interest for deeper work

Constraints

- Limited to existing relationships and teacher ability to engage with colleagues about the work

Dimensions of Scale



1. Widespread use

- Limited to a teacher's existing professional relationships

2. Depth of implementation

- May not promote deep practice change unless a strong collaboration around the work emerges

3. Shift in reform ownership

- BMTN teacher takes initiativeto spread ideas

4. Sustainability

- May not support sustained practice change unless a strong collaboration around the work emerges
- Informal sharing may cease once the network stops meeting

Formal Presentations at Conferences

The second scale strategy, **formal presentations**, emerged after BMTN teachers had been in the network for a couple of years. The BMTN hub intentionally seeded opportunities for a few teachers to formally present about the BMTN at various practitioner-focused and academic conferences. Hub members invited and encouraged teachers, providing development support as well as financial support for travel.

Examples

- BMTN teacher presents at National Council of Teachers of Mathematics conference
- The BMTN hub presents with BMTN teachers at the Carnegie Foundation for the Advancement of Teaching's Annual Improvement Summit

Strategy Description

Hub resources needed

- Hub support for content development and travel resources

Additional resources needed

- Teacher experience, own strategies, tools

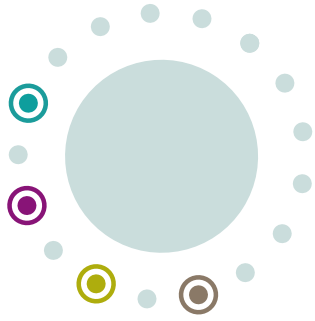
Affordances

- Creates relatively easy opportunities for spread beyond network participants and teachers' own school contexts
- Provides a leadership opportunity for interested and motivated teachers

Constraints

- Opportunity depends on conference acceptance
- Long lag between acceptance and presentation

Dimensions of Scale



1. Widespread use

- Potential for broad reach by connecting with participants at multiple conferences

2. Depth of implementation

- Presentation alone may not have substantial impact on practice due to lack of support for audience translation and implementation in own contexts

3. Shift in reform ownership

- BMTN teachers take initiative to seek out and secure an opportunity to present at a conference

4. Sustainability

- Presentations will likely cease when funding ends

Dissemination through Website and Newsletter

The third strategy to emerge was the hub's development of **formal communication mechanisms** through a website, the distribution of a newsletter, and engagement with social media platforms. These efforts were geared toward a broad audience and sought to share network learnings and engage other teachers and organizations with the network's ongoing work.

Examples

- BMTN website
- BMTN newsletter

Strategy Description

Hub resources needed

- Requires ongoing content development and curation (e.g., designing formats for clarity of presentation; regularly updating the website)

Additional resources needed

- Teacher created materials (e.g., change ideas, reflections, videos)

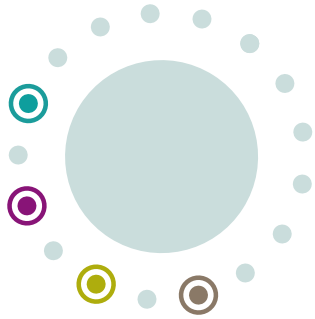
Affordances

- Can provide significant detail and resources to support new teachers' use of network tested change ideas

Constraints

- Requires initiative and sustained motivation by users to seek out and engage with resources

Dimensions of Scale



1. Widespread use

- Potential for broad reach beyond network and teacher contexts

2. Depth of implementation

- May not have substantial impact on practice due to lack of support for translation and implementation in own contexts and/or not enough information to take up deep changes

3. Shift in reform ownership

- Teachers did not own this strategy, as the BMTN hub led content generation and maintenance

4. Sustainability

- Website and archived resources will be available for duration of funding, possibly beyond with minimal additional resources

Hub-Led Spin-Off Communities

The fourth scale strategy was the formation of two additional **math learning communities** in Rhode Island, designed and implemented by the hub. These learning communities differed from the BMTN in that these math learning community teachers did not generate their own ideas for testing; instead, the hub provided participating teachers with change packages developed in the BMTN to try out in their classrooms.

Example

- Middle school and high school math learning communities in two new districts, operated by BMTN hub

Strategy Description

Hub resources needed

- Hub designed and facilitated sessions, representing a significant commitment

Additional resources needed

- District leadership buy-in and direct support
- Time to meet (district PD time, substitute teachers, or teacher personal time)

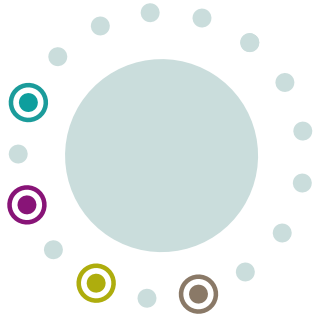
Affordances

- Ongoing and intensive learning opportunities more likely to impact participating teacher practice
- Can be built into school/district schedules and routines
- Can seed faculty collaborative routines on common work, building toward a common goal and learning together

Constraints

- Demand on hub to operate another community
- Required commitment from school/district partners to protect time and secure related resources

Dimensions of Scale



1. Widespread use

- Participants in learning community

2. Depth of implementation

- Sustained involvement and collaboration can support substantial changes in teaching practice

3. Shift in reform ownership

- Limited unless the hub works in collaboration with local educators

4. Sustainability

- Depends on alignment with school goals, school leadership buy-in, professional development structures and routines, and teacher buy-in

Member Spread in Home Contexts

The fifth scale strategy involved **BMTN teachers designing and leading professional learning communities**[3] in their own local school or district contexts.

Example

- Two BMTN teachers bring successful change ideas and improvement science methodology to their math department

Strategy Description

Hub resources needed

- Relatively low resource commitment: BMTN hub provides materials for introducing improvement science and structuring improvement testing

Additional resources needed

- BMTN teacher leadership and interest in developing local effort
- BMTN teacher leader time (design and lead meetings, create materials)
- Non-BMTN teacher time (attend meetings, try out the work in their classrooms)

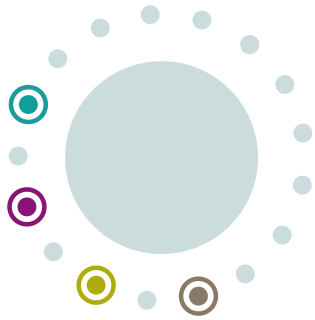
Affordances

- Teachers tend to be receptive to changes introduced by peers
- Can be built into school/district schedules and routines
- Can seed faculty collaborative routines on common work, building toward a common goal and learning together

Constraints

- Requires alignment with school goals, school leadership buy-in, professional development structures and routines, and teacher buy-in
- Teacher leaders must have ability to support and motivate colleagues
- Needs champion to maintain motivation

Dimensions of Scale



1. Widespread use

- Participants in learning community

2. Depth of implementation

- If the learning community takes up the work, teaching practice could change substantially with sustained involvement and collaboration

3. Shift in reform ownership

- Shifts ownership to BMTN teachers who take initiative to design and run learning community

4. Sustainability

- Depends on alignment with school goals, school leadership buy-in, professional development structures and routines, and teacher buy-in
- Teacher leaders must have ability to support and motivate colleagues

3 For an in-depth description of the fifth strategy—building local professional learning communities—see *Beyond the Networked Improvement Community: Scaling NIC Learning Through Local Professional Learning Communities,* available on the Nellie Mae Education Foundation's website.

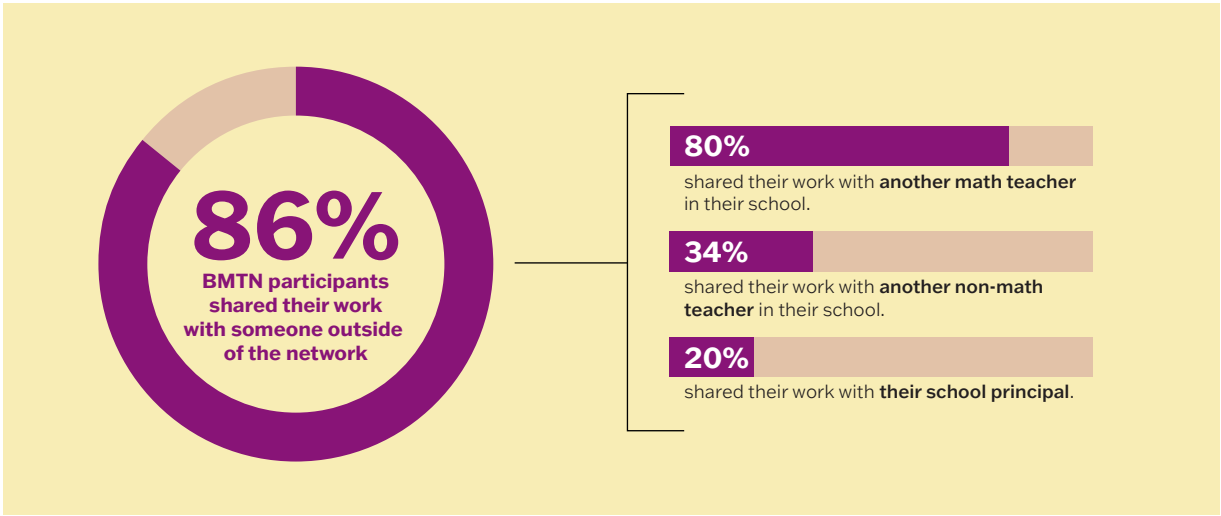
Potential for Each Strategy to Scale Network Learning

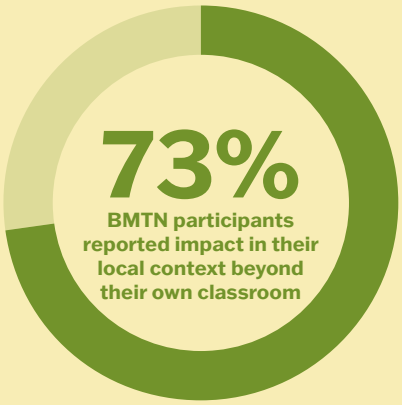
We found that each of these five approaches to scale had different potential for impact and reach, which is summarized in the graphic below. Network leaders might consider the impact of each strategy as they think about scaling their own network's learning.

Designing to scale NIC learning

BMTN Teachers Shared the Learning

Overall, the majority of teachers reported they shared something about BMTN with colleagues beyond the network. When they shared, they often used BMTN tools that summarized and presented the consolidated learning of the network: annual change idea books, rubrics for assessing deep engagement in algebra, and a member-generated task library. After funding for the BMTN ended, we asked teachers about their sharing practices. Here is a snapshot of what they reported:





Where was the work spread?

- **50%** Math department meetings
- **20%** District PD sessions
- **←9%** Faculty meetings

What was spread?

- **75%** Math routines
- **66%** Math ideas
- **55%** Math tasks
- **45%** Improvement science tools/processes
- **36%** Student-centered learning strategies
- **←5%** Other

Who was influenced?

- **64%** Other math teachers in my school
- **30%** Other math teachers in my district
- **30%** Other teachers in my school who do not teach math
- **23%** School leadership, specifically how it thinks about improvement, math teaching, and/or student-centered teaching
- **←7%** District leadership, specifically how it thinks about improvement, math teaching, and/or student-centered teaching

Conclusion

The Better Math Teaching Network serves as a case of an instructionally focused networked improvement community that developed powerful learning that could be scaled. Because BMTN teachers worked in a wide range of schools, districts, and states, centralized efforts to scale were not part of the network's design. The BMTN hub and teachers found other ways to share the learning and forward their shared aim of deeply engaging more high school math students in student-centered classrooms. Each strategy employed in the BMTN had tradeoffs—some were more likely to successfully scale, and those typically demanded more resources (e.g., the professional learning communities designed and run by the hub and BMTN teachers). In the end, the teachers in BMTN found many meaningful ways to share their learning and bring the network's ideas, strategies, and tools into their local environments. Their work can inspire other networks to test and tweak these five strategies as they seek to scale their own network's learning.

References

Bryk A., Gomez L., Grunow A., & LeMahieu P. (2015). *Learning to improve: How America's schools can get better at getting better.* Cambridge, MA: Harvard Education Publishing.

Coburn, C. E. (2003). Reconceptualizing scale: Moving beyond numbers to deep and lasting change. *Educational Researcher 32*(6), pp 3–12.

Appendix: Data Collection

Data sources	Explanation	Data collected
Interviews: PLC leaders	Interviews with BMTN teachers who led PLCs conducted at multiple time points	Year 3: N=4 Year 4: N=6
Network health survey PLC leaders	Surveys of all BMTN teachers to measure key features of the NIC concept, formal and informal connections to one another, and efforts to scale the BMTN work	Year 3: January 2019, June 2019 Year 4: February 2020, May 2020
PLC artifacts	Documentation provided by leaders sharing the work in their local schools/districts (e.g., slides used in presentations, templates for documenting tests of change, etc.).	Year 3: Collected from 4 teachers Year 4: Collected from 6 teachers
Interviews: PLC participants	Interviews with non-BMTN teachers who participated in four local spread efforts	Year 4: N = 12
Surveys: PLC participants	Surveys of non-BMTN teachers who participated in two BMTN teacher-led local spread efforts	Year 3: N = 84 Year 4: N = 18

Partners for Network Improvement
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University of Pittsburgh | Learning Research and Development Center

Murdoch Building
3420 Forbes Ave.
Pittsburgh, PA 15260
phone 412.624.7020
pni.pitt.edu
lrdc.pitt.edu

nellie mae EDUCATION FOUNDATION

1250 Hancock Street
Suite 205N
Quincy, MA 02169
toll-free 877.635.5436
fax 781.348.4299
nmefoundation.org