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Supporting and Retaining Early Career Mathematics Teachers Using an Online Community of Practice

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A Century of Leadership in Mathematics and Its Teaching

Rethinking Purposes and Best Practices of Mathematics Education

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ABSTRACT This study reports on efforts over several years to design and implement a yearlong intervention intended to support secondary mathematics teachers in their early years of teaching. The intervention is designed to retain early career secondary mathematics teachers in the profession by engaging them in the development of meaningful professional relationships with school-based mentors, and by creating an online community of practice for support with other professionals. The intervention itself consists of early career teachers and their mentors participating in monthly professional learning activities such as online meetings, videoconferencing panels with experts, and collaborative reading and discussions of timely, purposeful, and relevant content. The intervention is designed not to overburden participants and to be feasible for national implementation with little to no funding. This article presents the purpose, design, and implementation of the intervention, as well as a discussion of challenges faced and potential next steps and future directions for similar work.

KEYWORDS *teacher education, in-service professional development, secondary mathematics*

Purpose of Study

The most extensive survey of teacher mobility is the Teacher Follow-up Survey, conducted by the National Center of Educational Statistics and last administered in 2012-2013. In their analysis of this survey data, Carver-Thomas and Darling-Hammond (2019) reported that approximately 8% of all teachers are considered "movers'' and move to a different teaching job each year, while another 8% are considered "leavers" and leave the profession altogether, putting overall annual teacher turnover at about 16%. Research has found that the highest rate of teacher attrition occurs in high-needs schools (Fantilli & McDougall, 2009; Goldring et al., 2014). Most recently, Carver-Thomas and Darling-Hammond (2019) reported that turnover rates of mathematics and science teachers are almost 70% greater in Title 1 schools than non-Title 1 schools. As a result, the United States spends upwards of $7.3 billion annually to address teacher attrition (Learning Policy Institute, 2017; National Math + Science Initiative, 2014).

According to Carver-Thomas (2018), 40% of new mathematics and science teachers are underprepared, and are most likely to teach in high-needs schools with a majority of historically marginalized populations of students. Research has shown that when teachers leave the profession, this results in an increase in the proportion of teachers lacking experience or certification (Carver-Thomas & Darling-Hammond, 2019; Sutcher et al., 2019). This issue is further exacerbated in schools that predominantly serve students of color or low-income families, where teachers are much more likely to be prepared and recruited through alternative certification pathways (Carver-Thomas & Darling-Hammond, 2019). This attrition rate, in turn, is believed to "signal lower quality of education for students" (Sorensen & Ladd, 2020, p. 13). In addition, enrollment in teacher preparation programs

has also declined nationally by more than one third since 2010 (Partelow, 2019). The culmination of these factors has led to classrooms staffed with underprepared or unqualified teachers, which profoundly affects the mathematical preparation of students in high school, college, and beyond (Kini & Podolsky, 2016).

Researchers agree that challenges with mathematics teacher recruitment and retention need to be addressed to support the development of a stable and qualified teacher workforce (Carver-Thomas & Darling-Hammond, 2019; Fuller & Pendula, 2019). This entails building more cohesive systems of teacher preparation, development, and support (Espinoza et al., 2018; Mehta et al., 2015), as well as prioritizing recruitment and retention. In their synthesis of research on Science, Technology, Engineering, and Mathematics (STEM) teacher preparation and retention, Fuller and Pendola (2019) found several factors related to teacher attrition and turnover, including personal characteristics, school characteristics, school leadership, and the quality of preservice preparation. Teachers with certain personal characteristics, such as being younger, less experienced, close to retirement, identifying as a person of color, or having a graduate degree are more likely to leave a school or the profession (Carver-Thomas & Darling-Hammond, 2019). Fuller and Pendola (2019) also consistently found that school districts paying lower salaries tended to have higher attrition rates. Other studies found high attrition rates for school characteristics such as working conditions (unclean/unsafe facilities, poor administrative support, large class sizes, insufficient resources for students) as well as a school's Title I status (Scafidi et al., 2007; Simon & Johnson, 2015). Schools and districts need to put systems in place to support teachers, particularly those who are less experienced and who work in underserved communities, in order to retain them over time.

Many of the factors described above are systemic and cannot easily be addressed by an intervention. There is evidence, however, that other factors can be leveraged by teacher preparation programs and school districts. Research shows that teachers feel supported when given the opportunities to be involved and connected with colleagues, and that supports such as induction programs can have a positive impact on teacher retention (Ingersoll, 2012). These programs are designed to be comprehensive supports for novice teachers as they develop their practice and can include both tools and resources for teaching as well as professional development and mentoring partnerships (Kaufmann, 2007). A national survey of teachers found that a significant number of teachers identified involvement in professional learning communities, coaching, or mentoring as important support mechanisms for professional growth (Goe et al., 2017). Additionally, the more involved teachers were in professional development, the more likely they were to express a desire to teach in the long term (Coldwell, 2017). Berry and Berry (2017) state, "For teachers, a key aspect of the [National Council of Teachers of Mathematics (NCTM)] Professionalism Principle is recognizing that their own learning is never finished and that they must build a culture of professional collaboration that is driven by a sense of interdependence and collective responsibility" (p. 155). This suggests that teachers should be collaborative and prioritize professional learning early in their careers. Working from this literature and a survey conducted by our research team (Amick et al., 2020), we chose to focus on addressing the issue of teacher retention through an intervention meant to promote effective mentoring and provide professional development for novice teachers.

We report on the design and implementation of a cost-effective, easily replicable intervention for early career secondary mathematics teachers with the goal of positively impacting teacher retention. Thus far we have had mixed results in terms of participation, both in terms of the number of total participants as well as how actively participants have engaged in the interventions. Therefore, we also share the challenges faced and present lessons learned over two years of enacting the interventions to provide suggestions for future research.

Background

The authors of this paper are members of the Secondary Teacher Recruitment and Induction in Diverse Educational Settings (STRIDES) research action cluster (RAC) and work at institutions of higher education and state organizations across the United States. The work of this RAC addresses the Association of Mathematics Teacher Educators' (AMTE, 2017) *Standards for Preparing Teachers of Mathematics* Standard P.5—Recruitment and Retention of Teacher Candidates. Standard P.5 specifically delineates teacher recruitment and retention as one of the "five important standards that are essential aspects of effective mathematics teacher preparation programs" (p. 43). The STRIDES RAC is one of five RACs that were formed within Mathematics Teacher Education Partnership (MTE-P) that utilizes a Network Improvement Community (NIC) model, an alternative to locally structured problem solving groups, where professionals from different geographical and institutional settings bring individual strengths and perspectives to bear on

educational issues. The NIC model is supported by researchers such as Bryk et al. (2011) who state, "In an arena such as education, where market mechanisms are weak and where hierarchical command and control is not possible, networks provide a plausible alternative for productively organizing the diverse expertise needed to solve complex educational problems" (p. 5).

Our research team came together through the MTE-P with a shared interest in early career teacher support and retention. MTE-P as a whole is composed of over 40 teams across 31 states that include over 100 universities, university systems, community colleges, K-12 schools, and school districts. MTE-P participants work collaboratively to redesign secondary mathematics teacher preparation programs through coordinated research, development, and implementation efforts. The partnership takes a comprehensive approach to tackling this challenge, convening community colleges, universities, and university systems, as well as K-12 schools, state departments of education, and other education-focused organizations (for more information about the partnership, see Martin et al., 2020). The partnership serves as a clearinghouse for model programs and practices, and also advocates for change at university, state, and national levels.

Theoretical Framework

Novice teachers often feel isolated, and those feelings of isolation are often associated with teachers leaving the field (Carroll & Fulton, 2004; Schlichte et al., 2005). Our STRIDES RAC promotes the perspective that teacher retention would improve with the development of communities of practice to provide a support network to draw upon, including online communities (Wenger, 2011). Communities of practice are "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger, 2011, p.1). Wenger (2011) further shares three features that characterize communities of practice: a domain of interest, common members who participate in joint activities and discussions, and shared practice. For our work, the domain of interest is middle or high school mathematics teachings in the early years of a teacher's career. In this context, the community of practice consists of early career teachers who are being inducted into the field, mid-career mentor teachers, and university mathematics teacher education faculty. We recognize that the work of retaining teachers requires, in part, a focus on developing relationships within the educational community and promoting connectedness within the larger community (Minarik et al., 2003). Recently, our RAC has focused on creating an online community of practice with early career teachers, mentors, and university faculty to develop relationships across multiple states and teacher preparations programs to try to support and retain early career secondary mathematics teachers. It is our hope that by creating and fostering these communities of practice, early career secondary mathematics teachers will feel a sense of support and that any feelings of teacher isolation that may cause them to leave would be mitigated.

Past Work: Driving the Design

In 2014 our RAC created a survey as an initial step to study the current support systems of early career secondary mathematics teachers. The main goal of the survey was to better understand the degree to which early career mathematics teachers perceived various learning opportunities as influential to their interest in teaching mathematics. One research question guiding this work was: What is the perceived scope, nature, and impact of professional support for early career mathematics teachers? Members of our team created the survey through an iterative design and vetting process that extended from the fall of 2014 throughout early 2016. The survey consisted of 25 questions including multiple-choice, Likert scale, and open-ended items, asking respondents to report on their current support systems, job satisfaction, projected longevity in the field, and other related topics. We administered the survey in November of 2016 and gathered 144 responses from teachers across the United States. Results from this study were presented in Amick et al. (2020). By better understanding current support systems, we hoped to develop interventions that would strengthen and replicate systems proven to work, and attempt to improve broken ones. We present some of the main results that guided the design of our interventions in Table 1.

As shown in Table 1, the vast majority of novice teachers (134 out of 144) reported participating in mentoring or coaching. Of these 134 teachers, 88.8% found the experience to be moderately or very influential on their enthusiasm for teaching mathematics. This finding is consistent with other research on induction programs (Ingersoll & Strong, 2011; Youngs et al., 2019). In their review, Ingersoll and Strong (2011) found that induction programs and especially teacher mentoring programs positively influenced novice teachers' satisfaction, commitment, and/or retention. Further, the rates at which early career teachers left the field decreased significantly when they were paired with a mentor who taught the same subject area and shared a common planning

Table 1

Results from 2016 National Survey of Early-Career Mathematics Teachers

Learning Opportunity	Number of Participants	Influence of Experiences on Enthusiasm for Teaching Mathematics	
		Not Influential (% of Participants)	Moderately/Very Influential (% of Participants)
Mentoring/Coaching	134*	11.2	88.8
School/Department meetings	128*	34.4	65.6
Professional Coursework	60*	20	80
Professional Conference	60*	11.7	88.3
Online Community of Practice	50*	34	66
Online Resources	51*	35.3	64.7
* Out of 144 total respondents			

time (Ingersoll, 2012). He also found that having multiple induction supports such as meeting regularly with building leadership, engaging in formal mentoring programs, or being provided common planning time with colleagues, had a strong positive effect on retention (Ingersoll, 2012). With this past research and our survey results in mind, we sought to develop systems that could effectively support and retain early career mathematics teachers. We argue this work arises from the need to further explore, strengthen, and replicate these systems nationwide in an effort to increase early career mathematics teachers' longevity in the field.

Methods

In this section we report on the methods for recruiting participants; the design of two iterations of the implementation of a yearlong series of intervention activities situated within an online community of practice; and the sources of our data. Our overall methodology for this work is a design experiment approach (Cobb et al., 2003), focusing on a problem in practice and pragmatically designing an intervention to impact that problem with multiple iterations of implementation and (re)design.

Participants

To recruit early career secondary mathematics teachers for this study, we extended email invitations to recent graduates of teacher preparation programs at our home institutions at the start of the academic year. For our first year of implementation during the 2018-2019 academic year we only invited teachers in their first year of teaching, though in the second year of implementation in 2019-2020, we opened the participant pool to both first- and second-year secondary mathematics teachers in hopes of increasing the number of participants. We asked participants to commit to participating one hour per month in the study in exchange for a yearlong support intervention and a community of practice consisting of teachers in the same places in their careers. The goal of the interventions was to provide timely resources and information to participants that could subsequently foster opportunities to collaborate and discuss with mentors as well as the online community. We requested that participants recruit a mentor teacher if they did not have one assigned to them already, and we encouraged participants to seek a mentor who also taught mathematics, as research states having a mentor that teaches in the same field is most impactful (Ingersoll, 2012).

The participants for both years of implementation included a diverse group of early career secondary mathematics teachers located in Kentucky, California, Texas, New York, and Ohio, who taught a variety of mathematics courses and grade levels (6-12) in settings that ranged from large urban districts to small rural schools. During year one, seven teachers volunteered to participate. At the time of their registration (late August 2018), four of those teachers did not know who their school site mentors would be. During year two we expanded our recruitment of early career teachers and 15 teachers initially registered, 10 of whom already had school site mentors assigned.

Design

Due to both current research in the field and our RAC's survey results pointing toward mentoring as an extremely impactful induction experience, our group focused on the mentoring relationship as the basis for the first itera-

tion of our intervention. We enacted the first-year intervention throughout the 2018-2019 academic year. We designed the intervention to provide targeted support to first-year teachers by (1) strengthening the mentor/mentee relationship through monthly communications; (2) suggesting targeted discussion topics between the mentor/mentee teachers; and (3) providing synchronous online meetings to build a community of practice.

We designed the intervention to include approximately one hour of active participation each month to minimize the strain on the participating early career teachers. Furthermore, we designed the intervention to engage early career teachers with their mentors and to foster their engagement in an online community. For example, in one monthly intervention we sent out an article about effective mathematics teaching practices for participants and their mentors to read together and discuss. Activities such as this were intended to provide opportunities for the pairs to take part in learning together to provide a supported space for mentor teachers and first-year teachers to meet and build positive relationships. As our STRIDES RAC did not have funding to incentivize participation, the goal was to provide a structure to facilitate the development of a functioning community of practice by helping participants build relationships with their mentors, connect with other new teachers, and have access to timely, easy-to-implement interventions.

These activities were based both on the literature on novice teacher needs, as well as on the experiences of our research team. Several of our team currently support or have previously supported first- and second-year teachers through state-level induction programs. We relied heavily on those experiences in tandem with the current research to create a list of monthly engagement activities that would serve as the year one intervention. Current early career teachers who were graduates of the authors' teacher preparation programs also contributed to listing out monthly topics/activities that they felt would benefit them in these early and critical years. The activities were designed to be timely (for example, discussing high stakes testing prep in the spring). In addition to identifying topics related to general new teacher supports, we selected several topics aligned to the Common Core State Standards of Mathematical Practice (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010) and NCTM's (2014) *Effective Mathematics Teaching Practices.* For example, in October 2018 we organized a videoconference panel of teachers with three to five years of experience— early enough in their careers to be relatable to the participants. The goal of this videoconference was to offer participants a sounding board with which to vent frustrations, ask questions, and seek advice. According to the National Institute for Excellence in Teaching (2020), novice teachers often need support not only in learning the curriculum, but also in developing their ability to create and manage an engaging learning environment to meet the needs of diverse learners. Prevalent topics in our virtual discussion therefore included eliciting student thinking, student engagement and participation, and selecting and/or modifying curriculum. In November, we introduced participants to the *First Year Teacher Curve* (Moir, 1990), which describes the stages of anticipation, survival, disillusionment, rejuvenation, reflection, and anticipation that many first-year teachers experience. We encouraged participants to reflect on the curve, determine their current location on the curve, and talk to their mentors about their needs for support. We specifically chose to do this activity at this time of year because the First Year Teacher Curve suggests that the lowest point in a teacher's first year occurs during late October through December.

Before the winter break, we asked participants to engage in professional goal setting that would enable them to start fresh in the upcoming semester. Some of their goals included refocusing on classroom management by restating expectations and following through consistently with consequences; effectively using formative assessments to gauge procedural and conceptual understanding; and promoting student engagement through teacher questioning. After winter break, we asked the participants for midyear feedback based on their experiences thus far and the goals they set for the second semester. Our aim in soliciting this feedback was to determine if we needed to make modifications in the spring. One desire participants reported was to begin the second semester by establishing more collaborative and student-centered teaching practices. Based on this feedback, our research team distributed a number of mathematical tasks that focused on student-to-student discourse and supporting students in productive struggle, both proven methods to increase student engagement (NCTM, 2014). We followed up with a second videoconferencing session.

In an effort to improve the intervention, and in keeping with a design experiment approach, we modified the intervention over the course of the year based on continual analysis. To do so, we solicited monthly feedback from participants via email, as well as through a midyear survey administered in December 2018 and an end-of-year survey in May 2019. The research team utilized this information to make ongoing adjustments

to the intervention model in an attempt to better support participants and keep them engaged for the entire intervention year. After year one of implementation the team went through a data-driven (re)design process during the summer of 2019 to prepare for the second year of implementation in 2019-2020.

During the second intervention year, we made several changes to the program after examining the collective data from year one. For example, we added activities around standardized testing in mathematics and issues of equity as spring interventions based on participant feedback. In an effort to foster a stronger community during the second iteration of the intervention, we created a Facebook group for participants as another way to connect in the virtual environment between monthly sessions. We then posted resources to the page periodically to attempt to create an online space for dialogue among participants. We also sent an email in early September including several self-care resources and asked participants to peruse and discuss these resources with their mentor teachers. Making a personal commitment to self-care early on each school year was one common desire of the year-one participants.

Data Sources

The main data sources of this study consisted of feedback from the participants over the course of the year in response to prompts provided in monthly intervention emails, and also in midyear and end-of-year surveys completed by both the teachers and their mentors each intervention year. The mid- and end-of-year surveys collected information on how useful the new teachers found each of the monthly interventions, what supports they had, and what additional supports they wanted. The surveys also asked the new teachers whether the support they received through our program had an impact on whether or not they intended to continue in the profession in the future. We surveyed the mentor teachers at a later date on which aspects of the intervention seemed useful to the early career teachers, and to gather feedback on what we might improve for future implementations.

Results

In the first year of intervention, participants identified that they would like suggestions to address challenges they faced in their classrooms, including broad topics like classroom management as well as topics dealing specifically with implementing effective mathematics teaching practices. This led us to implement a revised set of intervention topics in the second year, as well as to include additional structures intended to foster community among participants. In spring 2020, as we completed our second year of implementation, we were still met with mixed results as to the usefulness of the intervention. We identified several specific challenges that may have impacted the success of the intervention in developing a well-functioning online community of practice: a lack of common times to engage synchronously, low engagement by mentors, and a sense of being overwhelmed by the participants by midyear.

First, for those who remained engaged with the group and attended sessions consistently both years, we received overwhelmingly positive feedback. This feedback was received via email and survey feedback and spoke to the usefulness of the videoconferencing teacher panels, both during the panel as well as after the panels. The early career teacher participants reported the panels as being helpful to connect and talk to others that have a shared experience. They also greatly appreciated the practical advice from the RAC members that was grounded in research. One participant expressed her gratitude for the work of the RAC in stating, "I am so very appreciative of all the work that you are doing for us and our kids. I always find the content you provide so insightful, and it helps me reflect." Unfortunately, the attendance for the videoconferencing teacher panels was low, with only two to five early career teachers participating in sessions each time they were offered across the two-year cycle of interventions. We attempted to address this in year two by staggering the panel meeting times, hosting a weekday evening session in the fall and a Saturday afternoon session in the spring. Novice teacher participants continued to report several challenges that impeded attending the panels including limited access to videoconferencing while on their school district's network, as well as afterschool and weekend coaching obligations during the proposed panel times. In the 2019-2020 year of implementation, even after staggering the meeting times, we had only four total participants in the teacher panels.

Second, although we encouraged the engagement of mentor teachers both years, we had no mentors join any of our virtual panels in either year of the interventions. In fact, in the data we collected across both cycles of intervention, many of our participating teachers reported that they had very little interaction with their assigned mentor teachers. For example, during year two of the intervention, a total of five participants completed the midyear survey and, of those, three reported having "little to no interaction with [their] mentor." In the survey, one participant described her relationship with her

mentor teacher as "non-existent. [It is] based on appearances and there is no real support. I lean on my ELA teacher team for support." Another participant shared a similar situation, stating that her mentor teacher was "distant." Even when participants reported having positive relationships with their mentors, the mentors did not engage with our interventions or teacher panels. One of the main intervention goals was to help foster relationships between new teachers and their mentors to provide a system of support, but instead, members of the research team and invited panelists were the only ones who engaged in the community of practice we attempted to develop. As a number of participants reported the lack of strong mentoring support being provided on site, our team sought to identify other ways to help support them through our interventions.

Finally, the novice teachers we received feedback from often reported feeling overwhelmed. Novice teachers were most overwhelmed with planning and managing student engagement. For example, in the midyear survey one participant shared, "Planning is my biggest issue this year. I feel as though I am just above water with planning. I don't want to spend all of my free time on school; it's not fair to my fiancé or myself!" Although we had hoped that our Facebook community could be a supportive environment for our early career teachers, this also required them to use their limited free time to engage. In addition, Facebook did not seem to be an engaging environment for some. One novice teacher explained their rationale for this as well and offered a potential suggestion: "I am not a Facebook person, so that is probably why I did not engage in many of those conversations. I saw them too late. I think it would be beneficial to have a Google Classroom setup instead. This would be an easy way to organize any materials you want to share and set up 'assignments' so we receive automatic reminders." Another participant shared that they tended to use Twitter as a preferred social media platform, while others reported face-to-face interactions as their favored method of networking with other teachers. The lack of a consistently used platform by participants made it difficult to foster relationships among participants via social media.

Overall, we struggled to keep novice teachers involved and engaged in the intervention beyond the first few months. This low participation aligned with their self-ratings on the midyear survey question "On a scale of 1 to 10, how overwhelmed do you feel in your job?" Novice teachers reported an average of 6.2 on their self-rankings of being overwhelmed (the highest teacher ranking themself a 10). In addition, four participants shared being either in "survival" or "disillusionment" on the new teacher curve when asked on Facebook, "Where are you on the new teacher curve?"

Discussion

The overall lack of participation across the two years, coupled with the decline in participation at the midway point of year two, led us to think critically about our approach in early spring 2020. In March 2020, with the onset of COVID-19 and the transition to remote learning by many schools around the country, the research team ended the yearlong intervention early so as not to overburden teachers further in a time of uncertainty. Even so, the team learned lessons that could benefit others who support early career teachers.

Our findings echo those of Youngs and colleagues (2019), whose synthesis of research on teacher induction programs found that interventions with first-year teachers seem to have little effect on the retention of STEM teachers. They attributed this to early career teachers likely being overwhelmed (Youngs et al., 2019). Although our sample size was small in years one and two of our intervention, the data we gathered and analyzed thus far support this finding. We found that keeping early career teachers engaged in a yearlong intervention was a major obstacle and, though the challenges were often not specific to mathematics, the potential resulting attrition rate of participation raises the question of what can be done to improve future efforts. We are now considering a focus on teachers in their second and third years of teaching and recommend the need for future research in this area. One potentially influencing factor was the inability of our research team to incentivize participation beyond the perceived benefits of participation itself.

The ways in which our participating teachers described the relationships with their mentors contradicts the results from our national survey of early career teachers (Amick et al., 2020). One possible reason for this disconnect might be the result of our intervention design. We were only able to encourage teachers to participate, but if it was a requirement, it may have resulted in better participation. We considered whether this lack of participation by mentors may have potentially influenced sustained teacher participation across the yearlong commitment. Fantilli and McDougall (2009) identified the need for induction programs to refine the mentor selection process in order to ensure novice teachers have adequate support. Therefore, another idea we

are examining is to center on mentors or teacher leaders for future iterations of the intervention, and to consider ways to help them support groups of mentees. This would be a significant shift in focus from our current intervention and participant recruitment methods, but it might help to develop strong mentorship teams. We have also considered taking a school team approach and involving an administrator, as past research has shown that perceived administrator support has an impact on early career STEM teachers (Youngs et al., 2019). Another subgroup of our RAC is exploring fostering new teachers' relationships with their administrators. For future work, we are considering combining efforts to strengthen support for early career mathematics teachers. We propose one approach: to build community within school-based teams of early career teachers, one to two mentor teachers, and an administrator. We hope that a collaborative approach might increase participation and thus help novice teachers succeed in their early years of teaching. We also look to expand the University faculty involved in this work to other MTEP partnerships as we are just a small subset of the larger NIC. Being a partner of MTEP allows for rapid dissemination of findings and also scaling of innovations, which we plan on taking advantage of in future iterations of this work.

Additionally, there is a need to consider the potential challenges that come with seeking to create a community of practice via a virtual environment extending across the country. Part of the goal of our intervention was to provide structures to support local mentor-mentee relationships, as well as to connect novice teachers to near peers with whom they could share ideas, challenges, and exchange support. Though we had difficulty keeping early career teachers engaged in our current intervention, we hypothesize that the "new normal" of virtual interactions established during the pandemic might lead to this type of intervention being more successful in the future. For example, limited teacher access to web conferencing software, such as Zoom or Teams, is likely no longer an issue as teaching moved online for many at some point during the pandemic. Furthermore, the pandemic has forced many teachers to move from making connections with their colleagues and students in person to doing so in virtual settings. The ease of participating in virtual workshops, training opportunities, and networking events has eliminated the barriers of distance and travel to engage with a broader community of practice. Such experiences may make early career teachers more likely to engage and remain engaged in online communities. Online support communities may also continue to be useful as the pandemic, at the time we are writing this, is still ongoing. Regardless of the situation, teachers still need support—particularly early career teachers. We see the creation and investigation of online communities of practice being even more important now because of the conditions created by the pandemic. We hope that others take up this work and can build upon the lessons we have learned to create meaningful and supportive online communities of practice that support and retain early career mathematics teachers.

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