

## Navigating Mathematics Teacher Preparation During A Time of Crisis

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# Navigating Mathematics Teacher Preparation During A Time of Crisis

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## Synopsis

In this paper we highlight the experience of a mathematics teacher educator (MTE) and their preservice teachers (PTs) in a middle school mathematics methods course during the 2020 shift to online instruction due to the COVID-19 pandemic. We believe it is valuable to report how the MTE reflected on their instructional decision-making in response to this massive transition to remote instruction. We also report that PTs needed support and guidance to employ new teaching practices they had learned in the methods course instead of reverting to familiar teaching methods.

**Keywords:** mathematics teacher preparation

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## Introduction

We, three mathematics teacher educators, share a reflection from one of our mathematics methods courses to illustrate how preservice teachers (PTs) can be encouraged and supported to continue employing research-based teaching practices. Our goal in sharing this reflection is to highlight PTs' experiences in this methods course, in order to guide mathematics teacher educators. In all our experiences with PTs, we found that when they were overwhelmed by new modes of instruction and assignments, they reverted to and favored teaching practices that were familiar to them. We believe it is valuable to report how mathematics teacher educators reflected on their instructional decision-making in response to the massive transition to remote instruction and how invisible norms regarding student needs became visible during this time of the pandemic. We delve into a single one of our reflections, in order to highlight the deeply held beliefs about what is important in mathematics education and the supports needed by both faculty and students to teach in times of crises.

## Preparing Preservice Mathematics Teachers During COVID-19

There is a strong need to improve various aspects of teacher preparation in the United States [6, 10, 23, 30]. One such area is the field experience of PTs [5, 27]. Campbell *et al.* [12] state that a common response to the need for field experience is to increase its duration, which does not necessarily enhance the quality of PTs' practical learning experience [13, 28]. Instead, a more productive course of action is to align coursework and fieldwork allowing PTs opportunities to learn about the teaching practices of in-service teachers [4, 8, 11, 15, 17, 18, 19, 20, 21]. PTs begin these experiences first in their university methods courses leading to actual K-12 classrooms [24]. These methods courses provide an initial experience where PTs can engage in classroom practices and begin developing their teaching philosophy. It is in their methods courses that mathematics teacher educators can support PTs to develop the resilience to engage in research-based teaching practices, even in challenging situations.

In current times, the COVID-19 pandemic induced a crisis in higher education, with multiple challenges [14]. For mathematics teacher education, rapid

shifts in practice occurred as instructors moved their courses online [2]. The pandemic forced unplanned changes with faculty shifting to online environments in order to continue providing education. These changes led to faculty members needing to make instructional decisions in terms of content and pedagogy. Some resulting actions included recording and delivering lectures online, course management in response to the transition, student access to online education, and accommodation of course assignment and assessment for the online environment [16]. These rapid changes in instructional modes were largely influenced by instructors' existing views on and practices of teaching and learning of mathematics. All these changes simultaneously can be difficult, especially for PTs, who are learning to take up research-based teaching practices that are new to them.

### Reflection on Micro-Teaching Before and During Pandemic

In this section we share our selected reflection from one of our courses to highlight PTs' challenges and the supports they may require. More specifically, the reflection provides an account from a middle school mathematics methods course taught by the first author (ZGR). In order to provide a personal account we are sharing this reflection in the first person.

#### *Introduction to the Reflection*

*I am an assistant professor in the department of middle, secondary and mathematics education at a mid-sized university catering to a mostly White student demographic. My department has educators in the areas of Social Studies-, English-, Science- and Mathematics Education with myself being the only secondary mathematics education faculty member. Prior to the Spring 2020 semester I had no experience teaching online courses; I had facilitated professional development for in-service teachers using an online platform but had never designed online instruction for students.*

*In terms of institutional support, there was a strong culture of dialogue within the department. Any university- or college-level decision regarding changes was clearly communicated and discussed within the department. These norms of communication and discussion transferred to the online actions taken during the crisis. The early communication from the department chair included*

*an emphasis on using sound judgment when deciding actions impacting both students and the faculty themselves. In addition to the daily emails received both from the department and the college of education, the department also met weekly to unpack recent happenings, ask questions, and share concerns. During these meetings, previous departmental norms already in place were crucial for developing a space where people felt safe to raise questions and discuss matters of concern.*

#### *Attending to Students' Circumstances*

*As part of transitioning to online instruction, the university instructed faculty to be mindful of students' access to the internet. The department chair specifically asked the faculty to email each and every student about their internet accessibility - and to report back about students who did not respond or would not be able to access online instruction. All of my students indicated having strong internet connections and confirmed being on board with online instruction. In the following weeks I continued to check in on them by asking them to share their concerns with me. My concerns were not just about the internet but more about what they might be dealing with during this time. In addition, my department chair stressed that these are not online courses; instead, faculty were taking their instruction online, so the transition could be difficult for students in more ways than predicted.*

*I spent a day or two just thinking about the best course of action as I read through my syllabi. Here, I focus on my mathematics methods course for middle school preservice teachers which was by far the most challenging to adjust my instruction for. For this course I started with the syllabus and realized how much of the course was built around fostering discourse in a mathematics classroom. I discussed every reading assignment in the classroom with my PTs asking questions, critiquing others' analysis of articles and adding to it. My questions to myself were, what do I bring online? What is possible? What is feasible? What is truly beneficial for my PTs? I settled on a version of classroom discourse in the form of online discussion provided through Canvas (online platform).*

*Micro-Teaching in a Remote Setting*

*An important component of my methods course is micro-teaching [3]. It provides PTs with experiences close to the actual teaching practice [3]. Micro-teaching includes short teaching episodes (5 - 10 minutes) where PTs plan a lesson and implement a part of it, they receive peer and professor feedback on their teaching and reflect on their experience along with the feedback. These short teaching episodes allow my PTs to plan a lesson, reflect on its implementation, experience their own strengths and challenges when teaching, and receive feedback from both their peers and the professor. The experiences gained during micro-teaching have been shown to benefit PSTs' learning. It aids in the development of skills like planning, time management, questioning, classroom management, communication skills and even their beliefs [7, 9, 26, 29].*

*The original syllabus included three micro-teaching projects, the first focusing on middle school content, the second focusing on use of technology, and the third including culturally responsive pedagogy. The first micro-teaching took place in an in-person classroom earlier in the semester before the university-wide campus closure due to the pandemic. PTs implemented sections of their lessons with their peers serving as their classroom students. This experience allowed the PTs to learn about components of their own teaching practice such as how fast or slow to speak, clarity of their sentences, asking questions etc. By the time the second micro-teaching was scheduled, the classes had already gone online. I communicated with my PTs during this time to learn about their concerns about online micro-teaching. I wanted to know if this activity was going to be useful for them or burden them unnecessarily. PTs overwhelmingly leaned towards including the micro-teaching assignment even if the format was virtual. They did express their concerns about engagement with their students.*

*I had to make a series of difficult planning choices to ensure this experience would be a good learning opportunity for my PTs. After trying out various platforms, I decided on Flipgrid as the medium for making and sharing online videos. I communicated to my PTs that the goal was to experience using technology to develop online instruction. The PTs expressed their concerns about online lessons in that they would not be able to engage with students.*

*In addition, their videos would not be interactive and would not be able to incorporate the mathematical discourse techniques they had learned in class. I assured them that this was a learning opportunity and that I was mindful of the circumstances in which they were doing the assignment.*

*When the PTs submitted their assignments their videos were absolutely different from the in-person micro-teaching they had done earlier in the semester. As the PTs had suspected, the online teaching was going to be difficult for them, they made online videos that overwhelmingly focused on direct instruction. They were lecturing in most of the videos. In the loss of a practical way to develop instruction in a new mode they had reverted back to a teaching style that was familiar. This was demotivating for me but I recognized that this could be a learning opportunity for my PTs as well as myself. I read about ways to make online instruction interactive so I could guide my PTs.*

*As I wrote feedback for all their video lessons, I knew this practice was different from how I had provided feedback in the past. The feedback I provided had to be different. The rubric I previously used to provide feedback on in-person micro-teaching included factors like questions asked, response to student questions, student discourse, etc. To provide feedback on the online videos, I developed a new rubric. I could retain some of the components of my original in-person rubric like mastery of content, design of activities, and clearly communicating the goal of the lesson, but I could not assess student engagement during the video lesson. I had to develop new categories like opportunities during the video to reflect, providing access to resources, defining the audience that the video was for, placement of the video lesson in a sequence so the audience knows what came before and what to expect after the video. Guided by this rubric, I gave students specific feedback on how to provide opportunities for their online audience to ask questions (e.g., provide an email, fictional video conferencing link, ask them to put their questions in the comments). I also asked students to provide discussion opportunities for their audience (I gave them the example of a class discussion board and how they were asked to post comments as well as respond to their peers' comments) and opportunities to reflect and check their own work.*

*In addition to my feedback, the students also watched their peers' videos and provided feedback. Their third micro-teaching videos included all the suggestions I had provided for improving their online instruction.*

*Most of their videos were still around direct instruction, where the PTs were working out solutions for their class; however, they added clear goals, information about what their students would have learned before and what would be coming next, resources for additional learning, asked questions for reflection, assignments to check for student understanding, and required discussion board posts.*

*The micro-teaching example highlights my own values about my role as a teacher educator. In this crisis situation, I had agency as a faculty member to make instructional decisions for my course. With this agency I was able to be flexible with my students and provide them the support they needed to feel comfortable using the pedagogical methods they had learned in the course. While one semester was not enough for my students to develop their confidence, I learned that when support is provided change can be supported even in unfamiliar and demanding situations.*

## **Looking Back**

We learned that in times of crisis, people revert back to their defaults. Preservice teachers here reverted to direct instruction in their micro-teaching, until guidance was provided. This is not to lay fault with preservice teachers; reversion is to be expected, and we, as mathematics teacher educators, were culpable of it in our own teaching too. Instead of wallowing in shame however, we chose to be aware of such tendencies and be intentional in how we could guide PTs forward and protect the progress we have made in terms of pedagogical improvement. As the pandemic continued, we noticed two divergent paths in how people reacted to the crisis: replicate their existing structures virtually (e.g. lecture online and proctor online timed tests) versus make use of the affordances of the virtual environment to change one's practice (e.g. greater flexibility of modalities for students and open book/notes exams). This is an area that needs further investigation. As we all go forth in this crisis and learn from it, it behooves us to try to understand these questions, of what conditions, both external and internal, it may take for long-term changes in practice to occur.

When student teachers enter teaching practice as novice mathematics teachers, they find it challenging to engage in standards-based teaching such as creating a student centered classroom [22]. They struggle to decide whether



to continue with challenging pedagogical methods or revert back to the familiar teacher-centered methods [22]. Student teachers need networks of support to teach in ways aligned with reform-based teaching recommendations [1, 25] especially in their first few years of teaching. In this reflection, we shared an example of students reverting back in a classroom that was a safe space devoid of the demands of an actual school district. However, when they reverted back, we provided them with ample guidance and support so that they could once again start to feel comfortable in this new and challenging situation. During their early years teaching they will definitely need more support, especially with the pressures of their new role and environment. Our pandemic experiences give us hope that we are equipped to provide such support.

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