

# Chapter 31

## Developing Teachers’ Knowledge for Teaching in Virtual Contexts: Lessons From the Pandemic of 2020–2021

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### ABSTRACT

*The 2020 worldwide pandemic signaled the COVID-19 crisis as a real threat and forced K-12 schools to move teaching and learning from face-to-face classrooms to online virtual classrooms. Educators searched for a silver lining amid the hardships created by the virtual teaching and learning environments. This chapter answers an important question: How has the knowledge that teachers need for teaching changed as a result of School Lockdown 2020-2021? Analysis of the chapters in this book in addition to extensive qualitative observations of two middle school virtual computer science classrooms over six months identified two important lessons needing consideration when requiring K-12 virtual instruction: (1) teachers’ knowledge for teaching requires developing their technological pedagogical content knowledge for teaching in both face-to-face and virtual contexts, and (2) teaching virtually relies on a social presence that assures students’ sense of belonging to engage in virtual learning experiences.*

### INTRODUCTION

Imagine that you are about to complete your college education with a secondary teaching license for teaching mathematics! What a delight to accept your dream job to teach middle school mathematics beginning in August. It is March 11, 2020 and you are finally paying attention to the world outside of

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finals and graduation. Suddenly, the World Health Organization declares COVID-19 a pandemic as a result of the significant increase in the number of cases outside China – over 118,000 cases in over 110 countries and territories with the very real potential for widespread community transmission. Can this possibly affect you and your plans? Obviously the answer is, “Yes!” Your graduation ceremony has been cancelled, but you will get your diploma, your teaching license and a middle school teaching position.

As you and most people worldwide realized, March 11, 2020 was the date when the COVID-19 crisis became real. The word pandemic gained new meaning! Suddenly, classroom doors were locked for the remainder of the school year and replaced with online instruction for the remainder of the school year. The scary part is that your first teaching position will most likely be a virtual teaching position. How long the instruction will be virtual is unknown. More importantly, you have never learned in a virtual environment and your teacher preparation program lacked any instruction for teaching in virtual environments.

Imagine how these revelations affected this graduating student who is about to enter the teaching profession. It will not be safe for schools to operate in face-to-face learning environments. Virtual instruction raised lots of questions as this graduate was about to enter a middle school classroom entirely online: How will this virtual environment operate? How will this change what she knows and understands about teaching mathematics to middle school students? How will the students gain the online access? Will she be asked to teach from home – to students entering from their homes? What kinds of technologies will be available for her and her students? There were so many unanswered questions at this point.

Fast forward to March 11, 2021. How did this first-year teacher manage teaching middle school mathematics in this virtual environment? What were the pedagogical challenges? How was teaching online different from her vision of teaching mathematics like she did in student teaching? Now, as teachers and their students returned to face-to-face instruction, did the instruction return to the old-normal regardless of what was learned? What best practices and pedagogical reasonings were gained from teaching virtually? At this point, many educators had lots of unanswered questions. What will happen in classrooms that return to face-to-face instruction? Do they return to teaching as they previously did? Or, have lessons been learned about new strategies for engaging students in learning? Have educators learned anything from the virtual instruction experience? Such questions prompted the goal for writing this book – to gather best practices and the pedagogical reasonings for responding to these questions after identifying what lessons have been learned.

While the chapters for this book were being written, Niess (the first author of this chapter) participated in a research project to examine the knowledge two middle school teachers relied on when teaching virtually. These two teachers were each adding a new course – a computer science (CS) elective course separate from their mathematics classes. Through observations of their work, Niess analyzed how teaching a new course virtually influenced their teacher knowledge – the transformation of their Technological Pedagogical Content Knowledge (also called TPACK). What challenges did these teachers face in teaching a new academic content in addition to shifting from face-to-face to virtual teaching? After analysis of their teaching, key themes from their virtual teaching experiences were identified. These themes were then aligned with the pedagogical reasoning and best practice themes collected from this book's chapters in response to two important questions:

1. How was teacher knowledge challenged as a result of School Lockdown 2020-2021?
2. What lessons were learned that teacher educators might rely on for preparing all teachers - pre-service and in-service – for combining the best practices and pedagogical reasonings in virtual teaching with face-to-face teaching of K-12 students in the twenty-first century?

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