Lessons Learned from Two Teacher Educators: What COVID-19 Can Teach us about Preparing Elementary Preservice Teachers to Teach the Next Generation of Students

2022 SITE

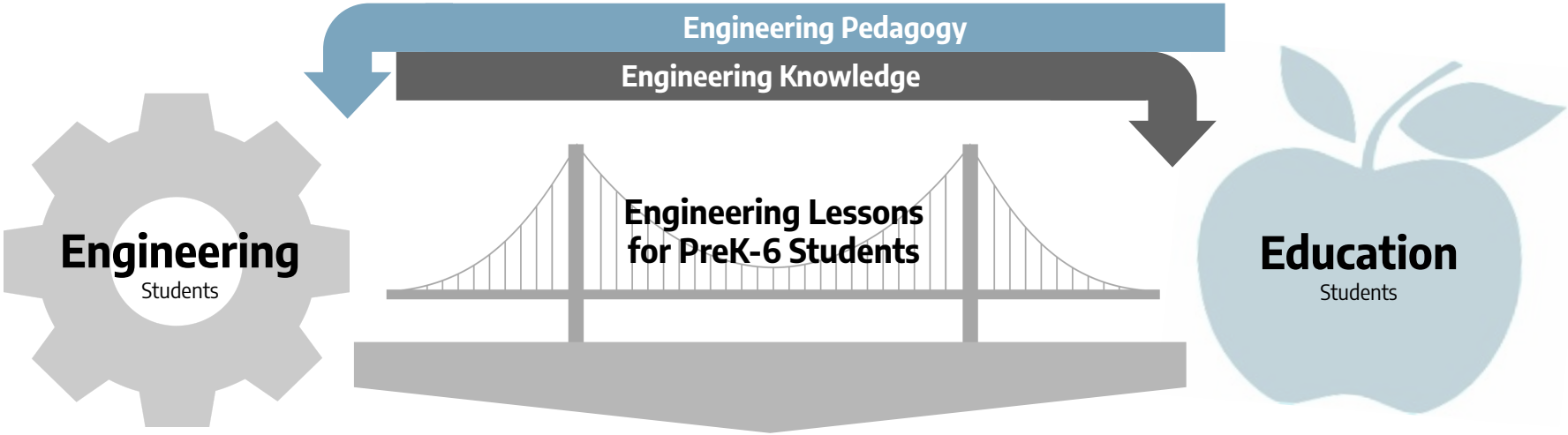
Min Jung Lee
Postdoctoral Fellow

Jennifer Kidd
Master Lecturer

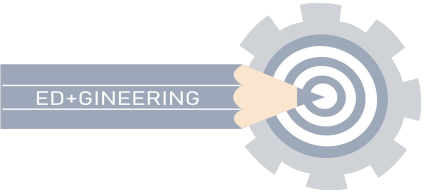
Kristie Gutierrez
Assistant Professor

ED+GINEERING

An NSF-funded Multidisciplinary Collaborative Service-Learning Project



- Knowledge of Engineering Practices
- Knowledge of Engineering Pedagogy
- Beliefs about Engineering Integration
- Self-efficacy for Engineering Instruction
- Intention to Integrate Engineering



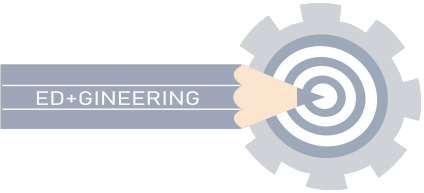
Background

During the Pandemic:

- During COVID-19, most educators opted for synchronous delivery to replicate the real-time interaction in face-to-face practice (Henriksen et al., 2020), however this brought unforeseen challenges, such as Zoom fatigue (Schulman, 2020).
- Online education experts suggest there should be a balance between synchronous and asynchronous sessions as the associated benefits and challenges of both modalities are different (Lowenthal et al., 2020).

Preservice Teachers (PSTs) and Use of Technology

- Though this generation of PSTs is often comfortable using technologies, research shows that they feel unprepared to effectively integrate technologies into their lessons (Ottenbreit-Leftwich et al., 2010).
- PSTs' lack of knowledge and their beliefs about technology are barriers to integrating technology into their instruction (Hew & Brush, 2007; Kim et al., 2013).
- PSTs need more frequent interactions with technology [either step-by-step instruction (Beyerbach et al., 2001) or observing successful technology usage] in order to understand how technology can be used, how valuable it is, and how feasible it is to integrate into their lessons (Lim & Chan, 2007).



Research Question

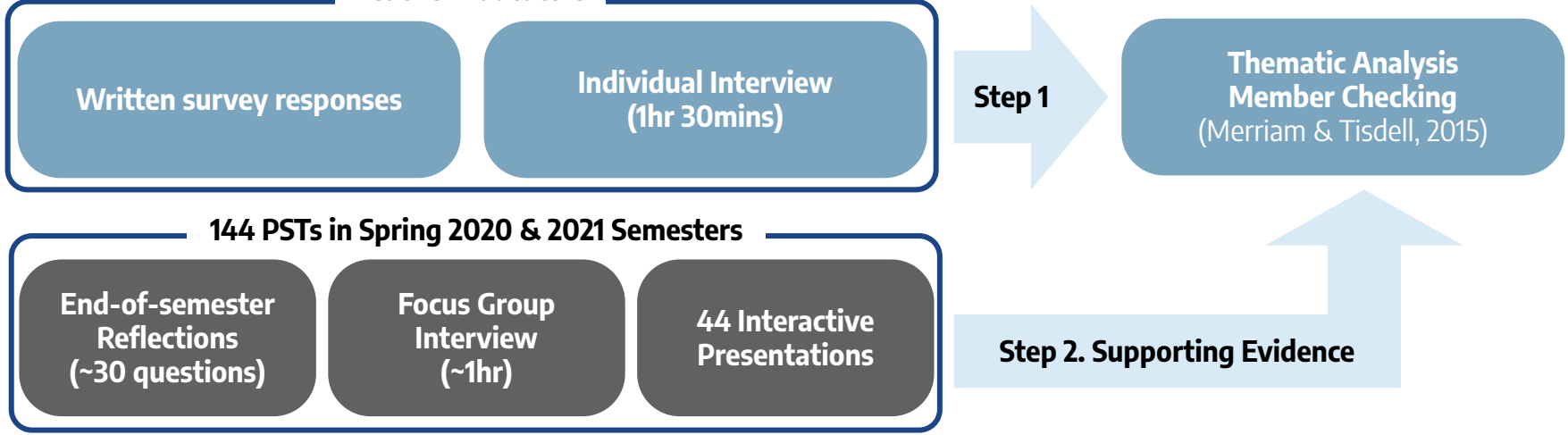
Purpose:
Lessons that two teacher educators learned during their time teaching remotely (Spring 2020-Spring 2021)

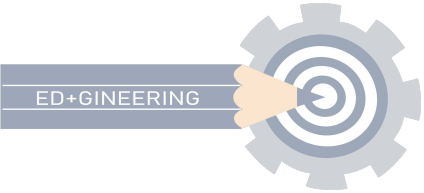
Research Question:
To what extent did remote teaching (Spring 2020-Spring 2021) influence two teacher educators' future preparation for teaching elementary PSTs?

Methodology

Multiple-case study (Yin, 2009)

Integrated two teacher educators' (second & third author) experiences of teaching and supporting 144 PSTs to teach engineering online across three education courses (Spring 2020 - Spring 2021)





Project Context

Collaboration 1

Educational Foundations
(1st education course)

+

Information Literacy for Engineers
(100 level course)

Intended PK-6 Student Interaction:
Team = 2-4 PSTs + 2-4 UESs
Develop and deliver engineering lesson to 4th/5th graders during their visit to the university campus

Mode Elementary Lessons Taught:
Fall 2019: In-person instruction
Spring 2020: Async instruction
Spring 2021: Sync instruction

Collaboration 2

Instructional Technology
(2nd education course)

+

Computing/Electromechanical Systems
(300/400 level courses)

Intended PK-6 Student Interaction:
Team = PST + UES + 5th grader(s)
Design, build, and code a single bio-inspired robot to 5th graders enrolled in after-school technology club

Mode Elementary Lessons Taught:
Fall 2019: All 5 sessions in-person; Each *team* made 1 robot
Spring 2020 & 2021: 5 Sync instruction; Each *team member* made 1 robot

Collaboration 3

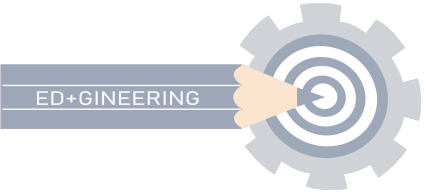
PK-6 Science Methods
(middle-level education course)

+

Fluid Dynamics
(300 level course)

Intended PK-6 Student Interaction:
Team = 2 PSTs + 2-4 UESs
Develop and deliver engineering lesson to 4th/5th graders during their visit to the university campus

Mode Elementary Lessons Taught:
Fall 2019: No lessons taught
Spring 2020: Async instruction
Spring 2021: Sync instruction



Finding 1

Change in PSTs' Attitudes and Beliefs about Technology Integration

Compared to previous semesters, the two teacher educators noticed the rapid change in elementary PSTs' attitudes and beliefs toward technology integration in their teaching

I think that the pandemic has made this [technology integration] an easier sell to my students overall. Because sometimes I have a hard time convincing my students... they still see technology as being about teacher use. It's about me knowing how to use PowerPoint, or me knowing how to use YouTube. Instead, it's about how do you facilitate your students to use technology.

Second author, Interview, Spring 2021

It [transition to online] showed that... technology is a great resource to facilitate learning.

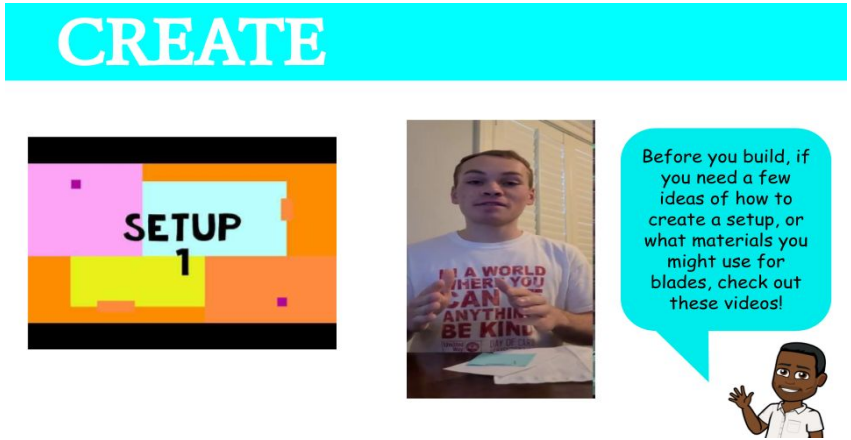
PST's reflection from K-12 Instructional Technologies, Spring 2020

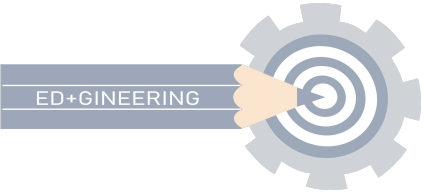
Finding 2

PSTs' Selection and Use of Educational Technologies

- Elementary PSTs tended to use technologies they felt most comfortable with (e.g., Google Slides) or that were currently in vogue (e.g., Bitmojis) regardless of whether or not they matched their communication needs
- Teacher educators need to provide PSTs an opportunity to evaluate how technology applications align with their instructional goals and how to select tools that can best support their instructional strategies so that they can develop TPACK

> It's a two-step process; me teaching it [content of the lesson] appropriately using, modeling, and showing different types of technology and apps and whatnot. But also, helping to teach them how to select what's appropriate for the fourth-grade students to learn these things virtually.
>
> Second Author, Interview, Spring 2021





Finding 3

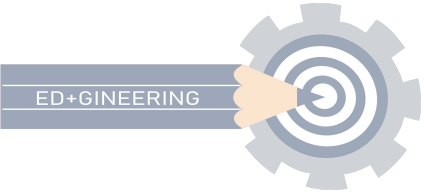
Importance of Interaction and Feedback from K-12 Students

- Feedback from Elementary Students adds value (validates PST efforts: helps PSTs evaluate their effectiveness) - PSTs were required to add formative assessment items in their lesson
- Important for lessons in both online delivery modes: PSTs desire feedback and interaction with elementary students

> They [elementary PSTs] could have learned more how they got more feedback on their their Google Forms, on their padlets, whatever before the end of the semester. We didn't get a ton of feedback from the kids, which was, you know, PSTs can't learn what went well, and what didn't.
>
> Third author, Interview, Spring 2021

> I also felt I did learn a bit less since I wasn't able to see the live reaction of the students, their engineering ideas, or conduct the lesson in person
>
> PST's reflection from Foundations of Education, Spring 2020

> I felt most confident about the way I was able to convey information between myself and my fifth grade partner, I felt we really clicked and I was able to guide her in a way that let her do most of the work
>
> PST's reflection from Instructional Technologies, Spring 2020



Finding 4

Hands-on Experience on Physical Hardware of Teaching Engineering Online

- PTSs greatly appreciated the opportunity to practice the coding with the physical hardware (i.e., Hummingbird Kit) at their own pace before teaching it to elementary students
- Teacher educators, who are specifically introducing PSTs to technology and engineering, need to allocate time and resources for PSTs to explore the physical hardware at their own pace

I actually loved being able to work with my own robotics kit. I think having to share with someone or multiple people would've caused me to be a bit less hands on and not as thorough. Having the kits at our disposal at home during the training phase helped a lot and I don't think ***I would've felt as comfortable if I didn't spend extra time playing around with the materials.*** I spent a few days in between training sessions messing with the codes and materials to be able to feel confident that I understood everything. After we started Wow club, I used the kit mostly in the time frame we had with our student but at this point, I had already ensured I was comfortable using everything.

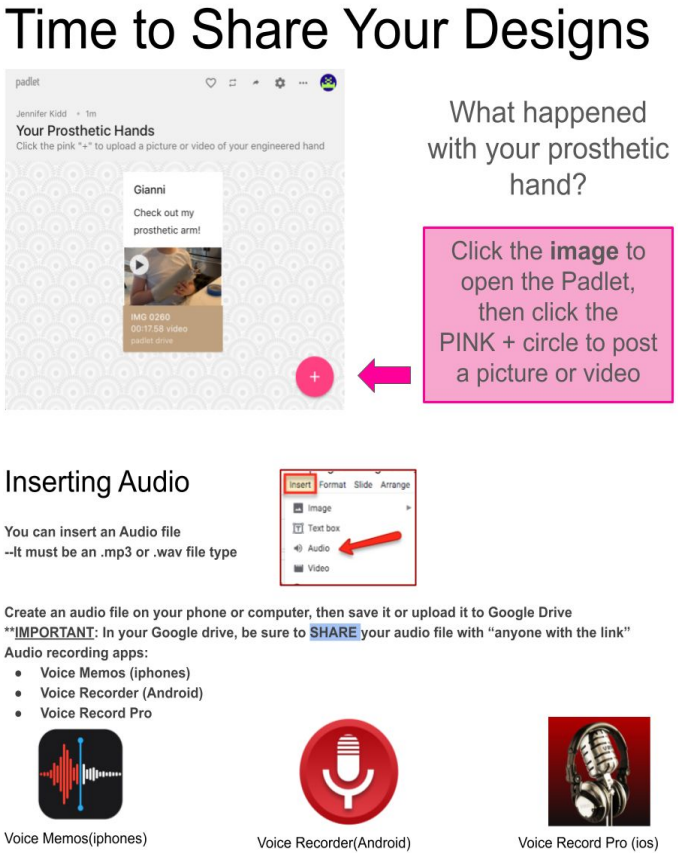
PST's reflection from instructional Technology, Spring 2021

Finding 5

Use of Digital Resources for Asynchronous Online Teaching

- Teacher educators provided supplemental digital resources to support students in the rapid transition they made from preparing in-person lessons to preparing online asynchronous lessons

> A sample seemed like the best way to help everyone [teams of PSTs and engineering students] be able to envision what this could look like and have this model to follow. And then, you have just a model, which is great, but then there's still the question of 'okay, we see your neat model, but we don't know how to do this. We don't know how to put the GIF in. We don't know how to embed the video. We don't know how to get audio in there'.
>
> Second Author, Interview, Spring 2021



Finding 5

Use of Digital Resources for Asynchronous Online Teaching

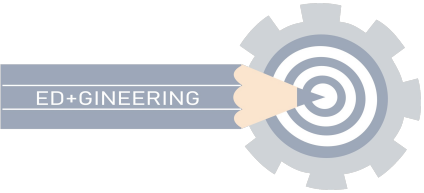
- Teacher educators learned that when providing supplemental resources to support online teaching, the structure and details of the template should complement the PSTs' experience in their teacher preparation program

I feel like our lessons all ended up looking like almost identical copies of each other. Because the way that we went in originally was we had the template for the lesson plan, so it was more of like a templated lesson that we did. So, you had to follow the template and just fit "what you wanted" in there. Like, so the materials that we chose, not a single material was included on the final materials list. So it's like how much impact did our group have on what the final project was?

PST's focus group from Foundations of Education, Spring 2021

I personally found the slideshow template and sample lesson to be the most beneficial resources. I think having the slideshow template helped us ensure we had the necessary information ready, without being concerned about constructing the slideshow from scratch and becoming caught up in the cosmetic part of it. I think it really allowed us to start working on the important aspects, which was the Engineering information and design challenge. The sample lesson was also beneficial to help us navigate how to create our challenge and entire project. It was the first stepping stone to help us make our way to an effective presentation and Engineering challenge.

PST's reflection from Science Methods, Spring 2021



Discussion & Implications

Implications for Teacher Education/Preparation

- PSTs need to be prepared for all forms of education (e.g., synchronous, asynchronous, or blended/concurrent) to be prepared for future teaching
- PSTs need explicit instruction in online pedagogy as it different from traditional teaching pedagogy
- PSTs need to have more interaction with K-12 students during the teacher preparation program as they acknowledge as an important part of their preparation
- Teacher educators need to carefully expose PSTs to appropriate technologies that align with their pedagogical and disciplinary goals
    - Selecting technology that aligns with teaching pedagogy
    - Providing PSTs a personal hands-on experience on the technologies

Thank you!

Want to know more about the project?
Click the following images!

Min Jung Lee
m1lee@odu.edu

Jennifer Kidd
JKidd@odu.edu

Kristie Gutierrez
kgutierr@odu.edu

This material is based upon work supported by the National Science Foundation under Grants #1821658 and #1908743. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.