Modify: Preparing Preservice Teachers to Foster Equitable and Inclusive Learning Environments Across Delivery Modalities

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Abstract: From teaching with technology to teaching through technology: this is an important shift that educator preparation programs must embrace as we develop teachers who can facilitate meaningful learning experiences across a variety of delivery modalities. Drawing on the data from our three-year mixed methods research, the authors outline a programmatic model for preparing teacher candidates to implement digital pedagogy while ensuring learning opportunities are equitable, accessible, and inclusive. This paper describes the Essential Elements of our critical digital pedagogy model for facilitating learning in hybrid, hyflex, and online environments and we identify a set of related indicators used to provide feedback to preservice teachers as they demonstrate their critical digital pedagogy during clinical experiences. We examine the research findings for how this programmatic approach impacts teacher candidates' knowledge, skills, and dispositions for transforming teaching and learning through technology and conclude with implications for the broader field of teacher education.
Keywords: Teacher education; TPACK; online teaching; critical digital pedagogy

Introduction

From teaching with technology to teaching through technology: this is an important shift that educator preparation programs must embrace as we continue to develop teachers who can facilitate meaningful learning experiences across a variety of delivery modalities. Drawing on the findings from our three-year mixed methods research study supported by the National Science Foundation, the authors describe Modify, a programmatic model for preparing teacher candidates to implement digital pedagogy while ensuring that learning opportunities are equitable, accessible, and inclusive of all learners. We identify the innovative approaches we are using in our Teacher Education Program to sequence learning and teaching opportunities for our candidates to develop their technological pedagogical content knowledge (TPACK) (Mishra & Koehler 2006) and related instructional skills. Throughout these experiences, pre-service teachers are asked to consider the "why" over the "what" of technology integration and are guided to draw on the SAMR framework (Puentedura 2006) to make informed instructional decisions as they teach online and integrate technology into face-to-face instruction. We approach digital pedagogy with a critical lens to ensure that our future educators are prepared to examine their practices and policies so that all students have access to the necessary resources and support across delivery modalities to ensure student engagement in transformational learning.

Literature

The *Reimagining the Role of Technology in Education: 2017 National Education Technology Plan Update* identified five ways in which teaching with technology improves learning. Among the benefits described is that

"technology access, when equitable, can help close the digital divide and make transformative learning opportunities available to all learners" (U.S. Department of Education 2017). To deepen student learning, this plan called for all teacher education programs to prepare teachers to use technology in meaningful ways and to develop educators to teach online. While the recommendations of this plan preceded the COVID-19 pandemic, the experience of pivoting to fully remote and online instruction exposed gaps in teacher preparation and provided a new urgency for recognizing that all preservice teachers need to know how to teach online and in hybrid models. Furthermore, considering the ways the COVID-19 pandemic exacerbated digital inequalities, preservice teachers also need to learn to adopt a critical lens to ensure their digital pedagogy is inclusive and equitable (Thorn & Vincent-Lacrin 2022).

Research published after the pandemic continued the call for preparing teachers to effectively support learning across delivery models. One of the ten priorities outlined in a *Framework for Restarting and Reinventing School* (Darling-Hammond, Schachner, & Edgerton 2020) is to strengthen distance and blended learning. In their recommendations, the authors stress the importance of supporting high-quality distance and blended learning models with educator training and materials that follow research-based principles to be as interactive and authentic as possible. Furthermore, they encourage the development of standards for digital learning that articulate how technology should be used to empower learners while enacting distance learning with attention to equity. In their article *Should Teachers be Trained in Emergency Remote Teaching? Lessons Learned from the COVID-19 Pandemic,* Trust and Whalen (2020) analyzed survey responses from 325 K-12 educators to provide recommendations for how to better prepare and support educators for teaching remotely in times of need. In their recommendations, they suggest that teacher education programs should infuse their curriculum with program-wide and program-deep high quality and quantity technology experiences. They suggest providing preservice teachers with the opportunity to develop K-12 online and blended teaching competencies so that they are prepared to teach in different formats, settings, and situations.

The more recent *2024 National Education Technology Plan Update* (U.S. Department of Education 2024) also provides actionable recommendations for closing the digital use, the digital design, and the digital access divides that currently exist across school districts in the United States. Most relevant to this discussion is the digital design divide which exists within and between systems that provide educators with the time and support needed to build their capacity with digital tools and those that do not. The recommendations include designing and sustaining systems that support ongoing learning for preservice and inservice teachers, providing them with the resources needed to design learning opportunities aligned with the Universal Design for Learning (UDL) Framework (CAST n.d.). Furthermore, the recommendations suggest developing a "Portrait of an Educator" that outlines the cognitive, personal, and interpersonal competencies educators should have to design learning experiences (p. 35).

This research study addresses these calls to prepare new teachers to effectively engage students in digital learning by offering a model of teacher development that focuses on equity and inclusivity, which aligns with the principles in the UDL framework. Furthermore, the Essential Elements and related instructional indicators that frame our programmatic model address the recommendation put forth by the U.S. Office of Educational Technology by identifying specific instructional strategies that provide a "Portrait of an Educator" for the preservice teachers in our educator preparation programs.

Conceptual Framework

Our research with preservice teachers draws on and extends three frameworks. One framework we use is the SAMR model, authored by Ruben Puentedura (2006). The model identifies four tiers of online learning, including substitution, augmentation, modification and redefinition, and these tiers are distinguished by their level of sophistication and transformative power. We use the model with our preservice teachers as they plan their online units, implement online teaching, and assess student learning. The model provides a frame of reference for reflecting on technology integration and considering how technology can be used to improve instruction, engage, and empower students, and how online learning can more closely resemble real-world learning. We acknowledge there are critiques of the model, including that the framework prioritizes teaching as a set of tasks rather than as a process (Hamilton, Rosenberg, & Akcaoglu 2016) and that there are great variations in how teachers and researchers correlate practices to the model (Major, Warwick, Rasmussen, Ludvigsen, & Cook 2018); however, we have chosen to use the framework as a reflective tool rather than as a rigid frame of analysis. Furthermore, since the model is used in K-12 school districts where our preservice teachers complete student teaching, we feel it is important that our teacher candidates enter the field with knowledge of the SAMR model.

We also use the TPACK framework (Mishra & Koehler 2006) as a model to support preservice teachers in reflecting on their development of technological pedagogical content knowledge (TPACK). As teacher educators, we have scaffolded development opportunities across our preparation programs. Preservice teachers first develop their knowledge and skills in the three primary domains reflected in the framework, including content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK) through their foundational courses. They extend their knowledge and skill in the intersecting domains including pedagogical content knowledge (PCK), technological content knowledge (TCK), and technological pedagogical knowledge (TPK) as they complete their methods courses. Together, these six aspects contribute toward a preservice teacher's overall efficacy in TPACK. In summary, we use the SAMR framework to enhance preservice teachers' planning, instruction, and assessment of online units and we use the TPACK framework to assess their development and efficacy in using information and communications technology to transform engagement and learning in online environments.

The third framework of Critical Digital Pedagogy (Stommel 2014) is used to establish online environments that are equitable, accessible, and inclusive of all learners. Stommel offers four characteristics of critical digital pedagogy, including: centering practice on community and collaboration; representing a multitude of voices; having application outside of traditional institutions of education; and, reimagining the ways that communication and collaboration happen across cultural and political boundaries. Our research team adapted Stommel's four characteristics into the criteria, or what we refer to as the Essential Elements, that serve as the basis for incorporating critical digital pedagogy across our teacher preparation programs:

Essential Element 1: Foster a Community of Learners and Enhance Collaboration Among Students

Essential Element 2: Honor Multiple Ways of Knowing and Emphasize the Importance of the Inquiry and Learning Process

Essential Element 3: Ground Inquiry and Learning in Culturally Relevant and Meaningful Contexts

Essential Element 4: Engage in Critical Reflection to Recognize Whether and How Communication and Collaboration are Inclusive of All Socio-cultural Perspectives

The following instructional practices serve as the indicators that teacher candidates are demonstrating the four Essential Elements of our critical digital pedagogy model (see Table 1). The purpose of the model is to prepare preservice teachers to facilitate learning environments that are equitable and inclusive of all learners through a variety of delivery modalities, including in fully online learning environments. This innovative framework identifies specific instructional moves our supervisors and cooperating teachers can use to provide feedback to preservice student teachers on their actual implementation of online teaching.

Table 1: Essential Elements with Instructional Indicators

Essential Element 1: Foster a community of learners and enhance collaboration among students
The teacher selects and uses digital tools to:
• Foster a community of learners • Establish and facilitate norms, expectations, and routines to create a safe and inclusive space for all • Facilitate opportunities for students to communicate and collaborate with each other
Essential Element 2: Honor multiple ways of knowing and emphasize the importance of the inquiry process
The teacher selects and uses digital tools to:
• Implement learning opportunities that allow students to collect and interpret evidence • Offer opportunities for students to construct knowledge in the learning environment • Use structures or processes for making learning visible in a variety of formats • Facilitate independent and collaborative inquiry, ensuring all students have equitable access
Essential Element 3: Ground inquiry in culturally relevant and meaningful contexts
The teacher selects and uses digital tools to:
• Make authentic connections and facilitates meaningful discussions between learning and student identity, experience, and culture • Create opportunities for students to ask critical questions about the content and authenticity of lessons • Facilitate an environment where all students apply concepts, have access and take ownership over learning
Essential Element 4: Engage in critical reflection to recognize whether and how communication and collaboration are inclusive of all socio-cultural perspectives

The teacher selects and uses digital tools to:
• Adapt instruction and assessment to meet the needs of students • Maximize the alignment between students' culture and school culture • Critically examine instructional practice to determine whether curriculum, teaching, and learning environments are inclusive of all perspectives

Methods

This research is a case study conducted at a private liberal arts university in the Midwest region of the United States and uses qualitative and quantitative evidence to inform policy and practice. The research team includes three faculty members from the Department of Education, one professor of mathematics from the Department of Physical and Computational Sciences, and one associate professor of biology from the Department of Life Sciences. Additionally, the project team includes one consultant in the field of instructional technology and one in equity and social justice pedagogy. We are completing the last year of a three-year longitudinal study that was funded through the Improving Undergraduate STEM Education division of the National Science Foundation (Award 2044325). For this project, we have implemented a mixed-methods approach to examine the following research questions:

- What are essential elements for implementing critical digital pedagogy to facilitate meaningful and equitable STEM inquiry in online learning environments?
- How does the integration of critical digital pedagogy methods into teacher preparation programs impact teachers' sense of efficacy for effectively facilitating STEM inquiry in online learning environments?

For the first question, the research team examined the conceptual frameworks listed above and conducted research in our disciplinary fields to create a literature review on best practices in online instruction. We also assessed online instructional lessons authored by preservice teachers in our education programs to identify examples of best practices in online instruction. By analyzing the existing literature, the preservice teacher online lessons, and our collective experience as faculty members, the research team used grounded theory to generate the instructional indicators for the Essential Elements of our program. The research team also collaborated with the project consultants to develop online professional learning opportunities for preservice teachers to develop their TPACK. These asynchronous online workshops are completed while preservice teachers engage in clinical experiences and the modules provide preservice teachers with background knowledge on SAMR and TPACK while fostering the Essential Elements and instructional indicators for the teacher preparation program. We refer to this critical digital pedagogy model as Modify as it prepares preservice teachers to teach concepts and processes effectively in online learning environments that are equitable and inclusive of all learners.

To address the second research question, the researchers in collaboration with an external evaluation team have collected data in the form of program documents including cooperating teacher evaluations, institutional data such as course evaluations, and efficacy surveys. Three survey instruments are used to collect quantitative data to evaluate the criteria for this project: the Online Teaching Self Efficacy Inventory (Gosselin, 2009) measures efficacy in online instruction, the Teacher Efficacy and Attitudes Toward STEM (T-STEM) Surveys (Friday Institute for Educational Innovation, 2012) measure efficacy in teaching STEM inquiry, and the Culturally Responsive Teaching Self Efficacy Survey (Siwatu, 2007) measures efficacy in culturally responsive teaching practices. The external evaluators have also conducted interviews and focus groups and provided the data to the research team.

Research participants include the members of the research team (n=7), IHE faculty members who have participated in professional development offerings (n=12), and preservice teachers (PSTs) who have consented to participate in the research study (n=76). The PSTs are divided into cohorts of students, which is dependent on when they completed their methods courses and whether they completed the Modify online professional learning. The control group completed their teacher preparation program prior to the implementation of Modify. Cohort 1 participated in Modify 1 but completed their teacher preparation program prior to the implementation of Modify 2 (2022-2023 academic year). Cohort 2 completed both Modify 1 and Modify 2 prior to student teaching and will complete their teacher preparation in the 2023-2024 academic year. At the end of each academic year, the evaluation team has analyzed the data related to research question 2 and reviews the findings with the research team. Additionally, the research team has collected student feedback on the design of the Modify online workshops and coded those responses according to the CDP criteria as an indicator of the effectiveness and impact of the online workshops on preservice teachers' TPACK.

While the objectives of the project include the professional development of faculty in higher education, the primary aim of the project is improving the knowledge, skills, and dispositions of preservice teachers. This paper shares the research findings and student outcomes related to this focus. Additionally, while the project focuses on facilitating STEM inquiry in online environments, this paper discusses what we have learned about preservice teacher development across all areas of instruction. Therefore, we include results of the Online Teaching Self Efficacy Inventory (OTSEI) without discussing the results of the T-STEM or CRTSE surveys. The findings of this case study may not be generalizable to other settings since the research findings are particular to the professional learning opportunities embedded in our teacher preparation programs. However, the power of case study research is not in making broad generalizations, but in offering nuanced findings (Yin 2009; Priya 2021) that allow readers to consider how they may use the results to inform their own work with preservice teachers. This particular study offers an important contribution that encourages preservice teachers to utilize technology across various modalities to ensure that in-person and online learning environments engage students in inquiry, allow for equitable access, and are inclusive of all learners.

Programmatic Model: Modify

As a result of engaging in this three-year project and analyzing programmatic data across our teacher preparation programs, we have implemented a programmatic model for developing our teacher candidates' readiness for teaching with and through technology. Our programmatic model is referred to as Modify and it is scaffolded across three phases in the Teacher Education Program (TEP). Phase 1 and Phase 2 each culminate in a Clinical Experience that includes an online asynchronous professional learning workshop called Modify 1 and Modify 2, respectively; these are designed to foster and then apply students' knowledge, skill, and dispositions for teaching with and through technology. The program culminates with the student teaching experience in Phase 3 when teacher candidates show evidence of their TPACK and receive feedback across a set of indicators that are aligned with the TEP's Essential Elements. Each of these development phases and experiences is described below.

Phase 1

Preservice teachers (PSTs) enroll in coursework for Phase 1 of the Teacher Education Program during the first and second years of a traditional four-year sequence. Foundations courses include content on educational psychology, planning and assessment, inclusive education, and education in an intercultural context. These courses provide foundational knowledge on learner development, learner differences, and learning environments. Faculty model effective technology integration and online teaching across all foundational and pre-methods courses. Preservice teachers develop their *technological knowledge (TK)* through using relevant applications in coursework and assignments. By the end of Phase 1 of their program, PSTs are familiar with how to use the Google suite of tools (i.e. Google docs, Sheets, Slides, Jamboard), Microsoft Office apps (i.e. Word, Excel, PowerPoint), online meeting apps (i.e. Zoom, Teams, Google Hangout), and learning management systems (i.e. Canvas).

Clinical 1

Modify 1 is an online learning workshop completed by teacher candidates in their first clinical experience to develop their *technological pedagogical knowledge (TPK)*. In Modify 1, preservice teachers are introduced to the SAMR model (Puentedura 2006). The SAMR model provides a frame of analysis for preservice teachers as they reflect on their use of technology to facilitate teaching and learning. Candidates complete case studies as they analyze the ways teachers utilize technology to enhance and transform learning.

Phase 2

Teacher candidates develop their *technological content knowledge (TCK)* through each of their methods courses. For candidates seeking licensure in elementary middle level education (K-9) they take methods courses in literacy, mathematics, science, and social studies. Candidates seeking licensure in grades K-12 or 4-12 take methods courses in disciplinary literacy and their content area. Instructors are provided with SAMR resources that enable preservice teachers to integrate technology into their instructional design to transform learning experiences. In each

methods course, instructors design at least one specific assignment that applies technological content knowledge to planning, teaching, and/or assessing student learning.

Clinical 2

Modify 2 is an online learning workshop completed by teacher candidates in their second clinical experience to build on TPK and TCK and foster their *technological pedagogical content knowledge (TPACK)*. Universal Design for Learning is a key theme in Modify 2. Modify 2 includes modules on planning and implementing asynchronous and synchronous online learning. As a culmination to Modify 2, preservice teachers plan and implement a learning segment in their clinical experience, and this learning segment includes a companion lesson that is fully asynchronous to provide opportunities for extension, reinforcement, and/or reteaching of the learning outcomes for the lesson.

Phase 3

Preservice teachers are provided with opportunities to refine their TPACK by planning and implementing synchronous and asynchronous learning in their student teaching placement. Preservice teachers are provided feedback by their cooperating teachers using the instructional indicators of the Essential Elements.

Analysis and Findings

To assess the impact of these specific and scaffolded development opportunities, our research team and program reviewers analyzed preservice teacher data across three years of the project. The first data source used to measure impact is the Online Teaching Self Efficacy inventory or OTSEI (Gosselin 2009). Teacher candidates in Cohort 1 were the first group of preservice teachers to complete Phase 2 and Phase 3 of the modified Teacher Education Program. Cohort 2 is the second group of students to enroll in the revised courses offered in Phase 2 of the program; they are currently completing Phase 2 and will complete Phase 3 in spring 2024.

The OTSEI pre/post means for Cohort 1 (student n=9) are shown in Figure 1. These are the results after Cohort 1 completed Phase 3 of their program. The pretest grand mean (2.78) vs. post-test grand mean (4.30) shows robust growth.

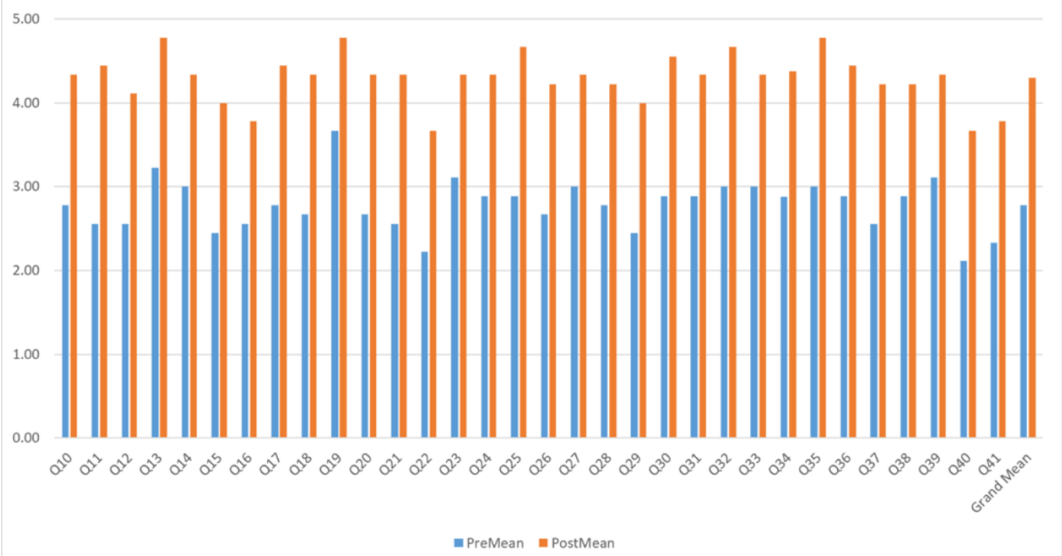

Figure 1: Cohort 1 OTSEI Pre/Post Means Spring 2023

The OTSEI pre/post means for Cohort 2 (student n=16) are shown in Figure 2. These are the results after Cohort 2 completed Phase 2 of their program. The pre-test grand mean (2.36) vs. post-test grand mean (4.01) again shows robust growth.

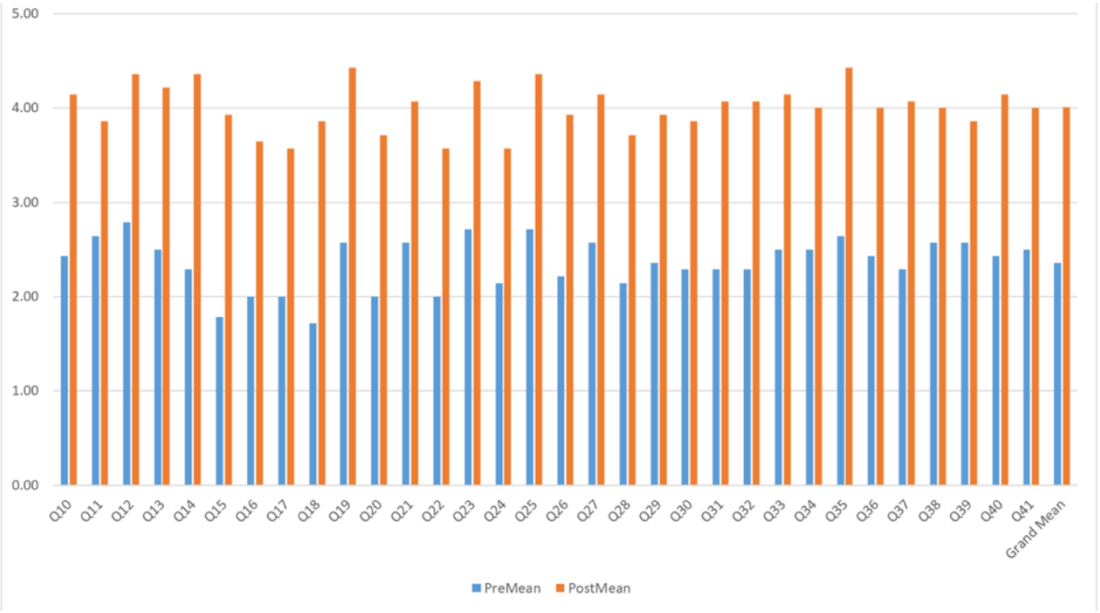

Figure 2: Cohort 2 OTSEI Pre/Post Means Spring 2023

The available data appear to indicate high levels of self-efficacy among both sets of treatment groups and it is reasonable to expect Cohort 2's post-test grand mean of 4.01 to be less than Cohort 1's post-test grand mean since they have not yet completed Phase 3 of their program.

An additional data source is the Essential Elements evaluation survey that was administered to cooperating teachers of Cohort 1, assessing each of their student teachers' abilities to effectively select and use digital tools and applications. Results from Quarter 3 and Quarter 4 (Spring semester 2023) administrations were quite similar, and consequently findings reported here are combined. Average ratings on the four-point efficacy scale (1 = ineffective, 4=very effective) for each item are shown in Table 2.

Table 2: Evaluation of Essential Elements Instructional Practices Indicators (Cohort 1-Spring 2023)

Item: In their teaching, how effective is your student teacher at selecting and using digital tools/apps to:	Mean Rating
1. Foster a community of learners	3.31
2. Establish norms and expectation to create a safe and inclusive space for all	3.50
3. Facilitate opportunities for students to communicate and collaborate with each other	3.19
4. Implement learning opportunities that allow students to collect and interpret evidence	3.06
5. Offer opportunities for students to construct knowledge in the learning environment	3.19
6. Use structures or processes for making learning visible in a variety of formats	3.38
7. Make authentic connections and facilitates meaningful discussions between learning and student identity, experience, and culture	2.94
8. Create opportunities for students to ask critical questions about the content and authenticity of lessons	2.88
9. Facilitate an environment where all students apply concepts, have access, and take ownership over learning	3.25
10. Adapt instruction and assessment to meet the needs of students	3.63
11. Maximize the alignment between students' culture and school culture	3.06
12. Critically examine instructional practice to determine whether curriculum, teaching, and learning environments are inclusive of all perspectives	3.25
Average Mean Rating	3.22

Mean ratings for all items fell between 3 (effective) and 4 (very effective) except for items 7 and 8, which fell just below the "effective" rating. These items indicate potential areas for increased focus during pre-service instruction and will be discussed below.

The third data source relevant to the development of teacher candidates' TPACK is student feedback from participation in the Modify 1 and Modify 2 asynchronous online workshops. At the completion of the online course, teacher candidates are asked to respond to the following question: describe one important point of understanding you have gained from the online workshop and how you can use this knowledge to improve your practice as a future teacher. Responses are coded using the Essential Elements instructional indicators as deductive themes. At the time of this paper submission, 162 students posted a response in Modify 1 and 29 students posted a response in Modify 2. Coded responses indicate preservice teachers are making more connections to Essential Element 2: Honor multiple ways of knowing and emphasize the importance of the inquiry and learning process and Essential Element 4: Engage in critical reflection to recognize whether and how communication and collaboration are inclusive of all socio-cultural perspectives. Teacher candidates are focusing on focusing on engaging students in learning, differentiating instruction, having a clear purpose for using technology, and ensuring inclusivity of technology use. On the other hand, preservice teachers are making fewer connections to Essential Element 1: Foster a community of learners and enhance collaboration among students and Essential Element 3: Ground inquiry in culturally relevant and meaningful contexts. This data indicates teacher candidates are potentially missing out on the opportunity to foster community and collaboration through technology and making learning authentic while empowering students.

Although coding showed that most student responses were categorized within one Essential Element, there was evidence that teacher candidates were processing their learning in ways that demonstrated multiple Essential Elements. To illustrate this point, here are two student responses, one from a preservice teacher who completed Modify 1 and another from a preservice teacher who complete Modify 2:

> "The most compelling reason to utilize technology for me was voice and connection for every student. Seeing the resources that are available to students now where they can create videos or post discussions online makes me excited as a future educator. I am excited to see my students who are more shy or nervous to speak in front of the whole class post their true ideas in a judgment-free zone. Using technology, Flip for example, really aids in the learning cycle for students. Not only does this allow students to think deeper about the content that they are submitting, but it can be a great way to have informal assessments. I will be able to gauge where my students are with the content I have taught by reading or watching their responses. I will also be able to give individualized feedback on these submissions. Students can also collaborate with each other, which creates a better sense of community, where students can bounce their ideas off of each other to have a deeper understanding of content." (Modify 1)

> "One important understanding that I have taken away from the online workshop is that if I as an educator successfully integrate TPACK which empowers educators to leverage technology effectively to enhance teaching strategies, deepen content understanding, and create authentic and engaging learning experiences for students, I will be able to meet students' diverse needs." (Modify 2)

With the first response, the teacher candidate references student collaboration (Essential Element 1), thinking deeper about the content (Essential Element 2), voice and choice for every student (Essential Element 3), and giving individualized feedback to each student (Essential Element 4). Within this second response, there is indication the teacher candidate recognizes that technology has the potential to increase student learning (Essential Element 2), create authentic learning experiences (Essential Element 3), and differentiate learning to meet the diverse needs of learners (Essential Element 4). This programmatic data provides valuable insights into teacher candidates' TPACK as they develop their knowledge and skills in the Essential Elements.

Discussion

While the data analysis conducted indicates there is evidence that the Modify critical digital pedagogy programmatic model is positively impacting preservice teachers' TPACK, there are notable implications the research team will continue to monitor. One key finding in our research is that teacher candidates were evaluated as less than "effective" for indicators 7 and 8 of the Essential Elements Instructional Practices. This indicates that preservice teachers are still developing in their abilities to demonstrate Essential Element 3: Ground Inquiry in

Culturally Relevant and Meaningful Contexts. This is an important consideration for the researchers and teacher educators to attend to, given the program's focus on critical pedagogy.

A second important implication in our research is that development opportunities must be scaffolded across coursework and clinical experiences to fully develop preservice teachers' technological pedagogical content knowledge. Otherwise, we observed evidence that the teacher candidates may develop technological content knowledge (TCK) and technological pedagogical knowledge (TPK), but inconsistently demonstrate their technological pedagogical content knowledge (TPACK). When this occurs, the preservice teachers are hyper focused on their teaching and managing the technology rather than turning their attention to student learning and consistently implementing best practices into their instruction, particularly in fully online environments.

To conclude this analysis, we offer the following insights, based on our data analysis and experiences in teacher education:

- Development of preservice teacher's competencies in technology integration and digital pedagogy must be scaffolded across teacher preparation programs, rather than relegated to one course.
- Preservice teachers should engage as learners across delivery modalities (in person, hyflex, asynchronous, synchronous) and need opportunities to plan and implement instruction across delivery models.
- Professional learning should be integrated in coursework and embedded within clinical experiences to foster the development of knowledge, skills, and dispositions.
- Teacher candidates benefit from receiving feedback from instructors and cooperating teachers on their development of their TPACK and related instructional skills.

While we recognize the research findings and implications are particular to our teacher education programs, we anticipate these implications are considerations for other teacher preparation programs, as well.

This research and analysis address the latest practices and advancements in the field of teacher education to inform the question of how educator preparation programs can effectively prepare teachers to foster equitable and inclusive learning environments across all delivery modalities, and specifically in fully online environments. We identified the innovative approaches we are using in our educator preparation program to sequence learning and teaching opportunities for our candidates to develop their technological pedagogical content knowledge and related instructional skills. The findings from this project offer a roadmap for teacher education programs that seek to prepare pre-service teachers to be effective and inclusive across delivery modalities.

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