

PREPARING TEACHERS IN CLINICAL FIELD EXPERIENCES THROUGH IMPROVEMENT SCIENCE: A CONCEPTUAL ANALYSIS

Dr. Lucinda M. Juárez

Our Lady of the Lake University-San Antonio

Dr. Melissa Mosly Wetzel

University of Texas at Austin

Dr. Samuel R. Brower

University of Houston

Dr. Patsy Y. Sosa-Sánchez

University of North Texas Dallas

Dr. Criselda Garcia

University of Texas Rio Grande Valley

Dr. Veronica L. Estrada

University of Texas Rio Grande Valley

Dr. Denise Davila

University of Texas at Austin

Dr. Erinn Whiteside

Texas A&M University-College Station

Kerry Alexander

University of Texas at Austin

Abstract

In March 2020, teacher educators representing seven university-based teacher preparation programs (TPPs) in the state of Texas pivoted their clinical field experiences online in response to the state's mandate due to the Covid-19 pandemic. This group collaborated as a networked improvement community (NIC) utilizing an improvement sciences approach for nearly three years to strengthen field-based teacher education. In collaboration with two educational foundations, NIC members took stock of what they knew about coaching from working together and how that knowledge might be adapted to the remote environment. In this paper, the authors identify four focus areas in moving to remote teaching and coaching: exploring program visions and enactments, teacher candidate support, mentor and field experiences support, and building reciprocal professional communities. Preliminary findings of the initiated change within institutions based on social justice and equity that will support learning in hybrid or remote context are explored and analyzed.

Keywords: teacher preparation programs, hybrid learning, remote learning, reciprocal professional communities, improvement science, networked improvement communities

Introduction

In 2018, a new initiative, Raising Texas Teachers, convened 11 university-based teacher preparation programs for a two-day “explorer’s workshop” for investigating persistent problems of practice. After considering the challenges teacher preparation programs (TPPs) face, the university-based programs form two groups focusing on different problems. The purpose of this paper is to share an overview of the systematic analysis of these four focus areas of moving to remote teaching and coaching through the lens of researchers using Plan-Do-Study-Act (PDSA) inquiry cycles. This paper informs the work of the seven universities (of which six are Hispanic serving Institutions, meaning 25% or more of the students identify as Hispanic) which begin to center their work on clinical field experiences, but its scope is not intended to be a comprehensive review of the work.

Through the guidance of the Carnegie Foundation for the Advancement of Teaching staff, participants learned about improvement science as a new approach for engaging in continuous improvement by creating a networked improvement community (NIC) to collectively “learn by doing.” As a learning community, NIC members represented a diverse group of programs committed to disrupting current understandings and challenging long-standing inequities in education collectively for the purpose of developing high-quality, clinically rich preparation for all aspiring teachers. The varying contexts within the universities provided new understandings about the field and contributed to the sensemaking process that was critical, particularly in light of the whole scale virtual instruction shift from previously relied upon from almost entirely face-to-face instruction TPPs relied upon prior to the pandemic. All necessary ethics approvals were obtained from the Institutional Review Boards of our NIC partner institutions -- University of Texas at Austin, University of Houston, Our Lady of the Lake University-San Antonio, University of North Texas - Dallas, and University of Texas Rio Grande Valley.

Through the co-creation of knowledge through dialogue and the application of improvement science tools, such as developing aims and driver diagrams to address the problems of practice in TPPs, the group determines two persistent problems in the field, providing high-quality field experiences to transform the teaching practice and improving communications between university Supervisors, Mentor Teachers, and Clinical Teachers and coaching to build on innovative teaching practices for learners in the 21st century. While NIC leadership created organizational and operational activities for partners throughout the pandemic, such as scheduling of continuous monthly online meetings and engaging university partners in monthly coaching huddles, NIC members engaged in discussions to explore and determine the impact of remote interventions on specific problems of practices of the TPPs at the university/district partnerships levels. Specifically, through a series of learning lab sessions in which Clinical Teachers go to receive academic support, or to the programs schools create that deliver academic support, university teams continue learning to coach, using the PDSA inquiry cycles, and applying improvement science processes and tools grounded in social justice and equity for developing working theories for scaling promising practices in delivering high-quality clinical preparation in programs.

Framework Development

The NIC in the initial convening meetings began exploring the process of using improvement science principles or constructs, (to be identified in section 2.1 of the paper) for creating a working theory of improvement with emphasis on equity-focused practices for collectively tackling a persistent problem of practice in teacher preparation. This improvement science lens of analysis affords the cohort of universities to examine variability factors and individual contexts for testing a hypothesis for improving

the clinical experiences of teacher candidates and improving coaching in programs. In conclusion, a description of the implications for adopting improvement science advances the framework for continuous improvement. The implications of sharing the NIC's journey may prove valuable to other programs that struggle with operationalizing improvement science while maintaining an intentional focus on equity-focused practices.

The paper begins with a description of the constructs of improvement science coupled with the creation of a NIC for accelerating learning. Key operational definitions along with a brief review of the related literature are provided. What follows is a description of the process for developing a working theory of improvement with an emphasis on the intentionality of adopting an equity lens in the process.

Conceptual Framework

In this first section of the paper, we describe in detail the conceptual framework for testing the theory resulting from PDSA inquiry cycles by NIC members, along with significant learnings to launch a subsequent cycle in the iterative process.

Improvement Science

With the complexities of improving programs in education systems, using improvement science as a framework for gaining insight into the overall system that is yielding the current outcomes proves novel in the field. The foundations for improvement science are rooted in the early work of Walter A. Shewhart and W.E. Deming, (1986). These improvement science foundational principles would continue to be applied to a wide range of industries (Deming, 1986, 2000). Improvement science is a method for building knowledge of systems that produce outcomes and theories of enacting changes to these systems (Lewis, 2015). Improvement science as an applied science has improved practice in industry and health care (Rother, 2009; Gawande & America, 2007) but more recently permeated into the education field showing positive outcomes (Bryk et al., 2015). The field of education is a complex one that requires multidimensional systems to work together for the betterment of our students in public education, who are led by the product of educator preparation programs. The nation's schools are in constant reformation, by which some have been more detrimental than beneficial in improving schools (Bryk et al, 2015).

For school reform efforts, improvement science enables educators working in different contexts to identify contextual factors causing challenges and allow inquiry cycles to be implemented and tested to refine change models (Wright, 2019). Six core or reform principles/ constructs driving improvement are that reform is “(1) problem-focused and user-centered work; (2) focus on variation in performance across contexts; (3) consideration of local contexts while ‘seeing the system’; (4) embracing of measurement for area of improvement; (5) rapid cycles of disciplined inquiry; and (6) focus on improvement through organizing as networks to share goals and align clear measures of improvement” (2019, p. 5). The improvement science framework embraces different types of knowledge for solving problems such as discipline specific knowledge along with knowledge of systems, variation and psychology (Lewis, 2015).

Review of Literature

The review of the literature on improvement science that follows in this paper highlights evidence of improvements in supporting beginning teachers in three large urban districts utilizing improvement science methods for solving persistent problems (Dolle et al., 2018). Some teacher preparation programs

have embraced improvement science as an approach to build capacity in organizational learning for engaging in continuous improvement (2018).

In the specific context of Clinical TPPs, applications of NIC principles and implementation of the improvement science framework, include literacy learning interventions by pre-service teachers for English language learners (Shaw, Lyon, Stoddart, Mosqueda & Menon, 2014); support for beginning teachers in the field by building a teaching effectiveness network (Hannan, Russell, Takahashi & Park, 2015); and improvement and progression of secondary mathematics teacher preparation (Martin & Gobstein, 2015).

Other pockets of research /scholarship have included a study conducted by Wright (2019) in studying the effectiveness of improvement science in education as an alternative to the traditional professional development of STEM teachers. Although emerging, the literature supports the use of improvement science to develop an understanding of the systems for reform efforts in the field of education (Bryk, et. al, 2015).

In a practical sense, the PDSA inquiry cycle provides educators with small-scale improvements to learn and expose gaps in understanding (Lewis, 2015). Within the NIC the improvement science framework supported disciplined inquiries in teacher preparation practices and supplied tools for understanding and studying the variations that exist in the curriculum and delivery of clinical field experiences.

Accelerating Learning within the NIC

By forming a NIC the group of teacher preparation programs began a process of mapping a complex problem space, which allowed a closer look at accountability relationships and the roles in the system for creating a cohesive working theory for improvement designed with the system in mind. The process includes spending 1-3 years learning together to share a language, collect, share and analyze data while making small changes in programs. Working collaboratively in NICs has been defined as an approach to quality assurance in education (LeMahieu et al., 2017). NICs are distinguished by four characteristics:

1. focused on a well-specified common aim;
2. guided by a deep understanding of the problem, the system that produces it, and a shared theory of improvement (i.e., an understanding of what to do about the problem);
3. disciplined by the rigor of improvement science; and,
4. coordinated to accelerate the development, testing, and refinement of interventions along with their more rapid diffusion out into the field and effective integration into varied educational contexts.

The process of accelerated learning also occurs through the shared language of improvement science work which became integral to creating a new learning community focused on improving the quality of clinical experiences in teacher preparation. Further terms of improvement science work are defined here as follows:

- **Aim Statement:** A statement, worded as a goal, which illustrates the aspiration of the improvement effort. An aim is accompanied by a theory of improvement, or driver diagram, which articulates what change can be made that will result in improvement.
- **Driver:** A structure, process, or norm within the system that, if changed, will result in improvement.

- Measurement System: A measurement system includes leading (ongoing) and lagging (summative) measures that will indicate progress towards an aim.
- PDSA Inquiry Cycles: An inquiry-based cycle of improvement work that helps a group learn about actions that might influence a driver and, ultimately, the aim. These cycles are accompanied by a collection of formative process measures and summative outcome measures. Measurement is frequent and helps programs to understand whether the changes made to clinical experiences are leading to improvement.

Developing a Working Theory of Improvement

NIC members prior to the pandemic had been meeting once per year face-to-face in Austin, Texas and online monthly to work on part of the collaborative work of the NIC included discussions centered on new insights into problems and potential solutions in clinical teacher performance. Developing a working theory of improvement can be defined as a view of a tentative hypothesis relating to ideas for improving the “system of interest” (Provost & Bennett, 2015). The initial phase in the continuous improvement efforts using this approach begins with articulating an aim statement outlining the desired outcomes, an intended improvement with direct outcome measure, and a timeframe. As a NIC, efforts toward increasing the quality of clinical experiences through various mechanisms are identified. The subsequent phase involves developing a driver diagram that serves as a visual conceptual map of the structures, and processes in the system that requires change to alter the outcomes (see Figure 1). Notably, the fundamental inquiry guiding the development of the aim is assessing whether teacher candidates (TCs) leaving our university-based programs are having the field experiences they need to build transformative practices as teachers. Our aim statement operationalizes “transformative” as the culturally responsive, content-rich, social-justice focused and reflection-based practices that will sustain teachers in their careers (see, for example, Paris, 2012), and it also articulates a theory that these experiences would be high-quality if they reflected and produced transformative stances.

Conceptually, the driver diagram represents the key leverage points in the system as primary and secondary drivers that need to be attended to for designing change ideas that can advance the outcomes affiliated with the aim. As noted, parallel to this process involves diving deeply into discussions about providing all teacher candidates a quality clinical experiences program resulting in “less variability” amongst the different contexts. The final aim statement develops over time as a goal of, “...increasing the percentage of teacher candidates experiencing a cohesive network of high-quality equity focused coaching supports (Paris, 2012; Paris & Alim, 2014; Ladson-Billings, 2014). A driver diagram guides the process for accomplishing the aim in instances when there may not be evidence about how to produce positive outcomes and initiates new learning opportunities.

Analysis yields four foci known as primary drivers from the NIC for future research and inquiry towards our aim. The drivers identify the essentials in the system that are “necessary and sufficient for achieving intended outcomes” as described by Provost & Bennett (2015, p. 39).

While exploring potential primary drivers, we focus and decide upon four because of simplicity and usability (see Figure 1). These four drivers, or levers contribute to our work towards our aim including 1) exploring vision and program alignment and enactments, 2) field supervisor (FS) and mentor teacher (MT) support; 3) TC support, and 4) building reciprocal professional communities. Figure 1 is an illustration of our primary and secondary drivers as described below, as well as the change ideas we tested within each driver.

Enacting Improvement Science in this NIC across Institutions

In this section, we discuss in detail our vision and specific NIC partner program alignment and enactments across the institutions along with significant learnings to launch a subsequent cycle in the iterative process. The work of program alignment and enactments in sharing the NIC's journey may provide benefits to other programs that struggle with operationalizing continuous improvement while maintaining an intentional focus on equity focused practices.

Context for Coaching and Learning through Improvement Science

With over 170 universities and colleges in Texas, the enrollment of post-secondary education has reached approximately 1.5 million students. The universities represented for the purpose of this paper come from a wide range of higher education institutions varying in size and type such as private and public. According to the Texas Education Agency (TEA) enrollment in Texas Public Schools, the state's teachers serve approximately 5.37 million students in grades Pre-kindergarten through twelfth grade, numbers that were reported during the pandemic (Texas Education Agency, 2021). The diversity is extensive in that the 2020-2021 enrollment demographics showed 52.88% of students are Hispanic, 26% are White, 12.7% are African American, with the remaining percentages attributing to American Indian, Asian, Pacific Islander, and Multiracial, as choices provided by the enrollment applications in Texas public schools. In addition, TEA identifies instructional programs and special population groups according to services provided by school districts. Thus, many students are identified as bilingual or ESL, along with being an English Learner, gifted and talented, or having dyslexia or any other subgroup that may pertain to the student. However, it can be estimated that approximately 21% of students are in bilingual and ESL programs, and approximately 21% are identified as English Learners (Id).

Vision/Program Alignment and Enactments

Definition. Within a Teacher Preparation Program (TPP), *alignment* means the continuous effort to align courses, field experiences, and measurement with the vision of the program. Vision includes both the defined quality in terms of a TC leaving TPPs as well as quality in terms of a field experience that leads to TC learning. To analyze the systems of our TPPs, the question of how aligned these areas are arises, as do the design actions to increase alignment with program vision and practices among faculty/coursework, field supervisors/mentoring and coaching, mentor teachers/mentoring and coaching, and curriculum of the field experience. Within a TPP, *enactment* means the establishment of authoritative decisions and actions to make changes aligned with the vision of the program. Secondary drivers in this area include internal alignment in program design, assessing the value and quality of the field experiences, and communication between MTs and FSs. PDSA cycles used across institutions include enactments to analyze our field/course connections, assessment systems, and alignment of coaching across field experiences and courses. Next, we provide three examples of how the universities in the NIC embarked on alignment and enactments within the program.

University of Houston

Prior to the pandemic, the University of Houston (UH) concentrated on the primary driver of vision/program alignment and enactment. Internal alignment in the program design is in the secondary driver and we begin to examine how frequently our TCs are participating in a practice-based curriculum that provides opportunities for in-course coaching. During the pandemic, the focus of our first PDSA

cycle is on a primary driver, internal alignment in the program design (See Figure 1.). To ensure our TCs could enact practices in their clinical field experiences, university researchers want to examine the number of assignments in the program that are directly connecting theory to practice. The iterative process of the PDSA cycle allows us to engage faculty in a review of their course assignments in small cohorts. Given that PDSA cycles support small changes over time, this supported greater buy-in from faculty to engage in the process as it is not a program overhaul. Rather, it is sustained programmatic improvement conducted through the use of the PDSA cycle process in small cohorts of faculty members.

By applying pedagogical and curricular concepts is a core foundation of our teacher preparation program, TCs learn new theories and understand teaching methods through a balance of conceptual, application-based, and field-based assignments. Making sense of new theories, though, does not bridge the theory-to-practice divide unless there are opportunities to apply new learnings in courses and clinical field experiences. As part of the PDSA process, faculty are asked to categorize their major course assignments under three broad categories of conceptual or theoretical, application-based, and field-based. Faculty come together to define these three categories. The PDSA cycles are to be conducted in horizontally aligned cohorts. Through the PDSA cycle, findings indicate that at least half of the course assignments are application and/or field based. Findings also indicate that most of those assignments are in the last year of the program as Clinical teachers conduct their full year of student teaching. The learnings of this PDSA cycle promote internal alignment and enactments in the program design. An outcome is that faculty continuously work to redesign the first year of our program to ensure candidates receive greater opportunities to apply new learnings in both their courses and field experiences.

University of Texas Rio Grande Valley

The high-level element of work at The University Texas Rio Grande Valley (UTRGV) is in the system of program alignments prior to the pandemic. In our Teacher Preparation Program (TPP) we launch a PDSA to examine coherence among the program's vision, field/clinical experiences activities, and application in the field placement at a large high needs' campus serving 49% in Bilingual/ESL students. In searching for alignments between the UTRGV TPP's field assignments relative to the high school's academic needs, the PDSA supplied additional learning about the administrators' and cooperating teachers' views in terms of the value and practicability of the TPP's programmatic key assessments delivered in clinical experiences placements. The major learning is that the current field experience curriculum including the key assessment holds value and benefit as cooperating teachers notice. Cooperating teachers also notice that contrary to the predictions researchers made as part of planning in the PDSA, there is more alignment between the program's key assessment and the value and relevance of the field assignment. Surprisingly, cooperating teachers identify that the major challenge is not having structured time to discuss the delivery of the key assessment and discuss instruction along with planning together. Other significant findings are that teacher candidates articulate their role and expectations well, but the cooperating teachers want a formal orientation from the program and ongoing communication during the placements. In planning the next cycle of the PDSA, the pandemic forces school closures and pauses face-to-face field experiences at this campus. As field experiences begin to resume, the program will respond to the logistical challenges we identify and continue to solicit feedback regarding the program's field experiences curriculum in the inquiry cycle.

Our Lady of the Lake University-San Antonio

Prior to the pandemic, Our Lady of the Lake University-San Antonio (OLLU-SA) researchers explore the primary driver of vision/program alignment and enactment, as well as the secondary driver of communication between MTs and FSs, leading in testing of the change idea of collaborative coaching. From previously acquired knowledge through system analysis, findings indicate that pathways for FS communications with MTs often leave MTs solely relying on TCs for information. As a result, during the pandemic, online discussions occur inviting MTs to participate in the TCs orientation, which ultimately leads to change in the scheduling and implementation of Pre-, Observation, and Post-Conference (POP) cycles for TCs (Authors, 2019). Another change that occurs during the pandemic is that Instead of the FSs independently conducting four POP cycles with the TC, MTs collaboratively provide input, evaluation, and insights into all coaching cycles and MTs and become responsible for leading a one collaborative POP cycle resulting in five POP cycles of the TC overall. This inclusion process of the MTs becomes more instructive and supportive for TCs because it more readily explores part of their day-to-day challenges from the perspective of the day-to-day review of the teacher mentoring them. The significant learnings of this PDSA cycle create synergistic outcomes not only for the TC, but deeper, collaborative learnings and co-leadership responsibilities and satisfaction in the coaching process results for both FSs and MTs. In the next section, the second driver, we define and illustrate how we explore this driver in the NIC.

Field Supervisor and Mentor Teacher Support

As part of the PDSA inquiry cycles, NIC members learn that FSs and MTs ask for and want greater support on coaching due to the stress of the pandemic issues and the new challenges in teaching completely online.

Definition. Within a TPP, FS and MT support is defined as the ways teacher educators who coach and mentor within the field are prepared for and supported during the field experiences. Through systems analysis, an exploration of whether our FSs and MTs feel supported occurs, and an identification of actions that would further support these key MTs is examined. NIC members analyze mentor support from the TC perspective through surveys, from the MT and field supervisor perspective through interviews, and continue to analyze program documents. Findings reveal secondary drivers in the area of MT and FS support, as well. We also closely examine secondary drivers (See Figure 1).

University of North Texas Dallas

The University of North Texas- Dallas (UNT) Dallas, through the use of the PDSA cycles considers the examination of the TCs reflective component of the POP Cycle evaluation as an assessment of the value and quality of their field experiences. As the pandemic continues to disrupt, the coaching routine is altered, changing the TPP from face-to-face and in person to remote and virtual which proves to provide new challenges. UNT Dallas' goal is to sustain the support and mentorship to the TCs via the MT and UFS coaching and mentoring that happens during the field experience throughout the pandemic. To examine secondary data provided by the TCs, the emphasis is placed on objectively evaluating their reflective responses about coaching and mentoring that happens before, during and after the POP cycle and to continue to provide high quality TC support to the pre-pandemic level.

While the responses are valid and demonstrate objectivity on how the TCs feel about the results of their field experiences, they are not what was anticipated at the beginning of the PDSA cycle, nor are they able to provide objective comments on the effect of the coaching and mentoring during the virtual event provided by the MT and UFS. Thus, future PDSA cycles begin to provide a need for change, including greater encouragement that will allow for continued efforts to modify and revise the work to examine further the program enactments that may be helpful in the assessment of the value and quality of the field experience. For example, rewording the reflective question to demonstrate best if the support from MTs and UFSs are supporting the coaching and mentoring as needed by the TCs. While reflective narratives from the TCs may bring forth limitations, it is important to consider their objective narratives in identifying the effects of virtual or remote coaching forced by the pandemic and how to improve the coaching and experiences.

University of Houston

At UH, to explore the primary driver for supporting MTs and FSs, we focus on increasing communication between MTs and teacher candidates (TCs). We conduct a PDSA cycle on the use of Slack, a digital communication platform. Slack is a free communication program that allows teams to connect through whole-team channels and direct messaging. Researchers find that email and Blackboard communication are not conducive to collaboration and want to evaluate Slack as a change idea in the hope that the coaches' use of an instantaneous digital tool, could occur simultaneously and support greater collaboration. In adjusting our PDSA cycles during the pandemic, findings indicate a shifting when coaches reach out through Slack or the types of tasks participants are asked to complete, such as directly responding back to the coach or having to engage in a community-building activity, Slack participation is minimal to non-existent. In conducting follow-up interviews with TCs, we learn that they are reluctant to use Slack as it is not a communication tool they are using for their everyday digital communication, and they remain unfamiliar with its functionality. While this is not the outcome hoped for, the outcome alerts the researchers that any use of digital tools would require training or need to be something the participants are already utilizing.

Teacher Candidate Support

We learn as part of the PDSA inquiry cycles that TCs ask for and express wanting an even greater need for coaching, due to the stress of the pandemic issues and the new challenges TCs encounter, compounded by the need for completely online education.

Definition. Within a TPP, candidate support is defined as the ways a TC is prepared for the designed field experiences and how we support ongoing learning within those experiences. We examine secondary drivers including individualized support for TCs through coaching, increasing TCs' active engagement in coaching, and TC lesson planning. Change ideas that typically derive from PDSA inquiry cycles include the use of collaboratively designed protocols for virtual coaching, real-time coaching huddles in virtual teaching contexts (Fogarty & Schultz, 2010), and using various technologies in support of peer (TCs) coaching.

The University of Texas at Austin

The University of Texas -Austin (UT) focuses on the primary driver of TC support through the secondary driver of increasing active engagement of TCs in their coaching through a PDSA about

professional development about coaching to TCs. In the PDSA cycle, we provide professional learning opportunities for TCs about coaching. For example, we demonstrate how to shadow the MT and how to co-teach so they will be able to ask for opportunities with more agency. UT-Austin NIC partners' reflections on multiple cycles of PDSAs occur during coursework, creating more active and engaging learning environments for TCs.

Our Lady of the Lake University-San Antonio

In a PDSA connected to this primary driver of TC support, OLLU-SA focuses on the secondary driver of supporting culturally relevant lesson planning for TCs. Through information collected via TC surveys, TCs report self-confidence and self-efficacy issues surrounding lesson planning alignment to the Texas Essential Knowledge and Skills (TEKS) and the English Language Proficiency Standards (ELPS), the state's language learning standards, and report wanting more support in including integrating higher-order thinking questions into lesson plans and becoming more thoughtful in opening, closing and connecting lessons. TCs survey responses reveal having difficulty in planning for units, as they discuss having spent time practicing single lesson designing and mini-lesson creating prior to their year-long Clinical Teacher field placement. The PDSAs change ideas then focus on incorporating more explicit systematic culturally relevant inquiry and instruction, as well as TEKS/ELPS content in courses and encouraging planning in courses to encompass systematic unit planning prior to the clinical teaching year.

University of Texas Rio Grande Valley

At UTRGV, faculty members engage in a PDSA cycle that supports TCs with learning to teach two high-leverage practices (HLPs) including leading a group discussion and eliciting and interpreting students' thinking with mixed-reality simulations (MRS). High-leverage practices are described by TeachingWorks (<https://www.teachingworks.org/>), as fundamentals of teaching that are used constantly, are critical to helping students learn important content, support students social and emotional development, and are used across subject areas, grade levels, and contexts. HLPs are research-based practices that are to be used broadly and often in teaching (Maheady, 2015). They are "high-leverage" not only because they matter to student learning but because they are basic for advancing skill in teaching.

The change idea in this PDSA was to test the extent to which going through the process of viewing and decomposing a lesson targeting these two HLPs via video demonstration prior to rehearsing their own lesson in a mixed-reality simulation affected the TCs' sense of self-efficacy and cultural responsiveness. TCs completed parts 2 and 3 of the Teacher Beliefs and Mindset Survey (TBMS) before and after the MRS teaching demonstrations measuring their perceptions of teaching self-efficacy and cultural responsiveness; responded to three reflection questions; and completed self-assessments on their MRS teaching demonstration. These data indicate that TCs attribute increased levels of self-efficacy to the experience of viewing and decomposing the HLPs using video representations of practice prior to rehearsing them in mixed-reality simulations.

3.4 Reciprocal Professional Communities

Perhaps from the necessity of online instruction that occurred during the pandemic, NIC partners spent time collaborating with district and other partners.

Definition. Within a TPP, *reciprocal professional communities* (RPCs), are defined as both teacher preparation partners (TPPs) and school communities, such as and K-12 districts, who share understandings of one another's visions for teacher preparation; a structure for learning together about field experiences and how they support learning for mentors and TCs; and shared understandings of how to learn together to improve field experiences. We explore RPCs through our systems analysis whether we had shared understanding between the TPPs and district partners. Actions in PDSA cycles include using interviews to develop reciprocal relationships in support of a candidate within a field experience, for example, sharing our visions/goals as institutions; using data together, and developing a process for applying what we learn to our policies and practices.

Our Lady of the Lake University – San Antonio

One example of RPCs at OLLU-SA, extends from TPPs' field supervisors' work with MTs in collaborative coaching, as discussed above in section 3.1. The focus of the PDSA is on the mutual sharing of ideas and data within collaborative POP cycles. This RPC model allowed for joint coaching of strategies to improve TC online instruction throughout the field experiences. Because collaborative modeling arises out of reciprocity, an outgrowth of mutual learning and sharing of what strategies might be useful in any given time using technology tools to engage students. Joint solution thinking and implementation arose, between field supervisors, MTs and TCs, regarding greater support for differentiation of instruction. The increased communication enabled transformative coaching.

In the following section, we describe how we drew on our knowledge of systems and our innovations from our first years of work as a NIC when we were in the position to move into remote, hybrid, and hyflex modes during the Covid-19 pandemic.

Shifting During the Pandemic

We describe and narrate significant learnings from the shifts we made across the institutions between Spring 2020 and the present.

Drawing on Knowledge in Shifts to Remote and Hybrid Coaching

Spring 2020 proves to be a sharp awakening of how much reliance is on face-to-face coaching and in-person observations in our TPPs. Out of necessity we make hard, quick shifts to using Zoom and other online platforms for coaching in response to the shift in teaching contexts. Those shifts in teaching contexts include the following:

- Some university courses that previously included coaching opportunities shift to asynchronous modalities (online discussions, sharing videos to communicate course content);
- Clinical field experiences for TCs transition to being online as our local district partners move to online-only delivery. Some districts attempt to recreate a normal school day by holding synchronous class through sessions Zoom while other districts are mostly asynchronous with teachers offering sparsely attended office hours. The variation in online delivery amongst local districts, in most instances, prevent TCs from engaging in teaching online as TCs often become the instructional technology support for their MTs; and
- Most TCs do not receive face-to-face observations or conferences with MTs.

The priority of our partners in schools, MTs, is to ensure that the mental health and wellbeing of the students is being met as many students lack the technology requirements to fully participate in online school. Thankfully, our TCs could often support their MTs in this process while also assisting in the online environment through small-group discussion or one-on-one mentoring.

Over the summer of 2020, the opportunity to prepare more for the upcoming academic year finds partner universities asking how the current driver diagram relates to our shift to remote and hybrid coaching. We knew our district partners would begin the school year online with most reopening their physical campuses within the first two months. Our TCs began the school year conducting their clinical field experiences from home, as they did in Spring 2020, but as K-12 school reopened, TCs mirror their MT by teaching face-to-face, continuing to teach virtually, or teach in a hybrid manner. Additionally, local district partners request that coaching of TCs by field supervisors be conducted virtually to reduce transmission risks in classrooms. This shift at all large urban universities and school districts to virtual coaching also shifts all the PDSA work. In the next section, we share a few examples of how our PDSA cycles shift during this time across the four drivers. In Figure 1, we create shaded change ideas and additional drivers that we identify.

PDSA Cycles Shift

Most of our efforts specifically align with the primary drivers of Vision/Program Alignment and Enactments and in program design and supporting TCs during virtual teaching (see Figure 1). In terms of the primary driver of Vision/Program Alignment and Enactments, across universities we engage collectively in exploring how using a single, virtual coaching protocol would bring alignment to coaching in virtual settings. At UH and OLLU-SA, the PDSAs focus on the secondary driver of Internal Program Alignment in Program Design. A result of using shared protocols in virtual spaces is that more time one-on-one could be spent with TCs as field supervisors are no longer traveling to a multitude of school sites, up to two hours on the road daily. Not spending that time on the road and instead, spending it with TCs through virtual coaching meetings, allows them to spend more time coaching and mentoring candidates. This PDSA intersects directly with the primary driver of TC Support and the secondary driver of Providing Individualized Support for TCs.

Also connected to this secondary driver of Providing Individualized Support for TCs, at UT-Austin, the teacher educators use PDSAs to explore virtual huddling when coaching in the online environment. They pre-conference to decide on the appropriate technology (i.e. Google Docs, private chat in Zoom, or phone chat), and experiment with what kinds of coaching huddles would be most impactful and least distracting to the TCs. OLLU-SA also focuses on the secondary driver of Providing Individualized Support for TCs by providing new technologies to coach virtually, when they identify an inequity in coaching support for TCs who are teaching online versus those who they are teaching in person in face-to-face classroom and receiving more support. Supporting transformative coaching requires coaching using break-out rooms that blend both groups of students in break-out rooms to complete collaborative assignments such as on PearDeck, or discussions and peer review of writing assignments. The learnings from PDSA cycles informs this shift in hybrid/hyflex virtual contexts.

At UTRGV, the same primary driver is targeted for increasing greater alignment of program goals along with the secondary driver of providing support for TCs by using the common protocol in a mixed-reality simulation learning environment for coaching. With the pivot toward virtual field experiences including engaging TCs in instructional and educational activities to fulfill state-requirements, TCs

complete video-based analysis, engage in practice teaching sessions in their coursework, but also have the opportunity to join virtual coaching sessions on classroom management and parent-teacher conference scenarios using mixed reality simulations. PDSA cycles provide details about ways to improve the experience for providing TCs support in these areas.

Learnings from PDSA Cycles in Virtual Settings

Although these findings are preliminary, we share a few points about what we learn from shifts into virtual settings.

First, NIC partners shift the definition of clinical field experience in year two as the move by all K-12 students to remote settings occurs in spring 2020. To our original list of features of coaching, the following are included:

- Coaching can occur through asynchronous (e.g., coaching through email and discussion posts) and synchronous (e.g., online discussions through Zoom, real-time chat) processes;
- Coaching relies on tools that are shared between TCs and FSs/MTs;
- Coaching can occur around synchronous (e.g., live observations) or asynchronous observations (videos of teaching);
- Teaching experiences can be either face-to-face, hybrid, hyflex, or remote; and
- Coaching takes into account the context of remote learning (e.g., respect for boundaries for people working in the home; taking care of children; etc.).

Articulating these features of virtual coaching expands our working definition of the spaces that we hope to study in order to move closer to our collective aim as a NIC. We see the importance of the early work we accomplish across programs to strengthen the programs we have from within, the first driver of our model; as well as the reciprocal partnerships between the TPPs and the districts. Those alignments and relationships enable us to innovate together to continue to provide coaching and field experiences for TCs when the educational mode changed.

We discover by examining our learning and work together as a NIC over time, that implementing improvement science develops into the democratization of research. Formalizing informal practices or practices that were not previously being tested results in bringing multiple stakeholders into the learning process. Engaging our field supervisors and program faculty in the research process inspires a paradigm shift regarding where research happens and who participates. The fostering of a reciprocal learning community bridges the course-based and field-based components of our program. The shift to practice-based research in the hands of practitioners eliminates institutional and methodological barriers to conducting research. Researching across the program while including all program personnel decentralizes research in our programs. Purposefully engaging field supervisors in PDSA cycles supports internal program alignment and enactments, but moreover, it provides an opportunity for field supervisors and program faculty to share findings and learn from one another. Often at institutions, it is the role of faculty to develop and assess programmatic goals, but through improvement science, we now equitably include field supervisors as well.

Finally, and perhaps most importantly, our transition to virtual coaching moves forward our commitments to equity and social justice. We understand and learn through the interconnections between the health and capacity of our university communities, our district partners, and the communities of families and students we serve in new, deeper ways.

Conclusion

Practical Implications and Future Directions

Our research and learning through our NIC is grounded in relationships. Improvement science work by this NIC was conducted collaboratively, in this case by members of seven institutions in a NIC focused on improving clinical field experiences. Our TPPs formed communities by developing understandings both within and across institutions. One unique feature of this NIC is the social responsibility we built towards one another. As an aside, when we moved our NIC into a remote space, we had built strong ties and friendships which support the ongoing work. We learn that working on these issues is not a one year endeavor, and the effort this community puts into understanding each other's contexts grows. Our developing a theory with improvement science that centers on social justice and equity bodes well for being in it together for the long haul. We find the PDSA inquiry cycle process accessible and helpful in refining their programs and affirming our journey at continuous improvement.

The implications of our collective learning are as follows. First, we have learned that systems that are relevant to our aim statement are not separate. Rather, there are iterative, recursive connections between them that are as important to study as the separate drivers. Future research will examine the intersections between the work we do within drivers to better understand these connections.

We have learned through writing this article that our data from PDSA cycles about the change to virtual instruction will be valuable to the field. Our next step is to analyze PDSA cycles to learn the features of and how we adapt those in the remote settings. We have developed three protocols for coaching in remote settings and will be evaluating their use and developing them over the course of the Spring of 2022.

Finally, NIC partners continue to explore upcoming iterative processes in the areas of expansion of equity focused coaching support in virtual environments, including coaching for equity and justice in 1) course-based settings; 2) centering equity and justice in virtual coaching cycles; 3) in mixed reality simulations, and 4) virtual equity coaching for graduates of justice oriented TPPs. Additionally, NIC partners continue to discuss and more deeply address ways to research how to further coach for culturally relevant, inclusive and sustaining pedagogy through interactions with all stakeholders beyond the TCs, including the FTs, and MTs. This expansion of social justice and equity focuses on coaching supports that continue to disrupt inequitable practices, power dynamics, and outcomes through continued use of improvement science frameworks.

Limitations

No limitations were identified, as this paper is a conceptual paper and not an empirical paper with a research design that would lead to limitations.

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