# SUPPORTING LEARNING TO TEACH IN EARLY FIELD EXPERIENCES: THE UTE MODEL

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*Most teacher preparation programs require prospective teachers (PTs) to engage in early field experiences (EFEs) prior to completing required coursework. These EFEs, however, may lack meaningful connections to course content and provide limited opportunities to experience the demands of classroom teaching. In this paper, we share evidence from the implementation of a novel kind of EFE, the "University Teaching Experience" (UTE) model, where secondary mathematics PTs receive mentoring from teacher educators (TEs) as they teach in a undergraduate mathematics course Findings reveal the importance of both guidance from TEs and observations of peer teaching for PTs learning in EFEs.*

Keywords: Teacher Education-Preservice

Field experience is an essential part of teacher preparation (Dewey, 1938; Zeichner, 2010). While all certification programs require PTs to complete a capstone field experience (typically called "student teaching"), *early* field experiences (EFEs) emerged around the time of laboratory schools with the premise that PTs should have opportunities to work in K-12 classrooms before and/or during their professional coursework to ground their understanding of pedagogical theory with practice (Dewey, 1938). Typical EFEs involve PTs in observing students in classroom environments during or conducting short episodes of instruction (Cruickshank & Metcalf, 1993).

Recent research indicates that the quality of field experiences matters; having more field experience in a teacher preparation program does not necessarily lead to better prepared PTs (Ronfeldt & Reininger, 2012). Current opportunities for PTs to gain teaching experience each have specific limitations. PTs that only observe in K-12 classrooms for their EFE have limited access to understanding the scope of teaching. Activities like microteaching segments of lessons with peers in a methods course may offer better opportunities for PTs to practice innovative methods than simply observing, as they can receive feedback from a university-based teacher educator. Microteaching is limited, however, in that teaching to one's peers is inherently an artificial instructional situation. School-based EFEs where PTs are engaged in instruction provide authentic opportunities for learning about the complexity of teaching in school settings. However, research documents a disconnect between what PTs see and experience in K-12 classrooms and what they learn about effective teaching in on-campus methods courses (Allsopp, DeMarie, Alvarez-McHatton & Doone, 2006; Zeichner, 2010). Additionally, school-based EFEs can involve some risk for the mentor teacher if the mentor teacher's performance evaluations are based on value-added measures, not to mention risk for students' learning.

In this paper, we report results from the implementation of a novel type of EFE that addresses some of the typical shortcomings of early field experiences in its design. The University Teaching Experience (UTE) model involves an undergraduate remedial, or non-credit, algebra course as a site for an EFE. The UTE model entails four components. One component (inquiry-oriented curriculum and task design) involves mathematics teacher educators (MTEs) as the methods course instructors

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collaborating with mathematics faculty responsible for the remedial mathematics course curriculum to design curricular sequences for the course that feature tasks (individual or series of problems) requiring a high level of cognitive demand (Stein, Grover & Henningsen, 1996). A second component (plan and implement) features PTs planning and teaching lessons in the remedial mathematics class while enrolled in their initial mathematics pedagogy course (hereafter referred to as the "methods course"). A third component of the UTE is the mentoring that is provided by MTEs during the planning, implementation, and reflection stages of lead PTs' teaching in the developmental mathematics course. The MTEs include the faculty course instructor and graduate assistants with secondary mathematics teaching background. The MTEs also model teaching practices and provide in-the-moment coaching, if needed, during PTs' teaching episodes. Finally, MTEs orchestrate a debrief discussion after the lesson with the lead PTs for each lesson and their peer PT observers to discuss the development of mathematics students' thinking and react to the decision making of the lead PTs. In addition, the debrief discussion offers an opportunity for PTs preparing to teach subsequent lessons to rehearse the beginning, or task set-up, phase of the lesson prior to actual enactment in the developmental mathematics course.

Initial research during the early-stage implementation of the UTE model established the viability of the model for ensuring an effective learning experience for the undergraduate students enrolled in the remedial mathematics course (Bieda, Wolf & McCrory, 2013; Bieda, McCrory & Wolf, 2014). The second phase of the project attended to the viability of this kind of EFE for PTs' learning. In this phase, we analyzed data from several sources to address the following research questions: *To what extent does the UTE support the development of PTs' planning for attending to student thinking as evidenced in their written lesson plans for UTE lessons? To what extent do PTs teach in the remedial math course in ways consistent with the methods and strategies to promote mathematical proficiency, (i.e.,* recognizing and building on students' prior knowledge, anticipating and responding to student thinking, selecting and sequencing students responses to achieve specific mathematical goals, pressing for justification and explanation, and maintaining a high level of cognitive demand during task enactment)? *Finally, how do PTs evaluate the opportunities to learn in the UTE and how do they compare those experiences to their work in a school-based placement during the second semester?*

## Theoretical Framework

We use *transformative learning theory* (Mezirow, 1997) as a frame for thinking about how PTs' knowledge about teaching develops through their interactions with activities and experiences in their teacher preparation program. According to Mezirow, transformative learning is the "process of effecting change in a *frame of reference*" (p. 5; italics in original). PTs' frames of reference with regards to teaching practice are composed of both *habits of mind* and a *point of view* (Mezirow, 1997). *Habits of mind* are "broad, abstract, orienting, habitual ways of thinking…" (Mezirow, 1997, p. 5) that are informed by the years of experience PTs have as students in classrooms (Lortie, 1975); by participating in the norms of school as students, PTs have absorbed a "set of codes" (Mezirow, 1997, p.6) that frame their understanding of what teachers do and what they did, as students of mathematics, in response. Similarly, Cuoco, Goldenberg and Mark (1996) talk about *mathematical habits of mind* as the "methods by which mathematics is created and techniques used by [mathematical] researchers" (p. 376) and, as such, are the ways that mathematicians think when solving problems.

Mezirow (1997) argues that points of view are responsive to feedback and shift as we reflect on the outcomes of our actions in the environment. A person's point of view can shift whenever we try to make sense of why something has happened in a way we did not anticipate (Mezirow, 1997). This is precisely the state of novice teaching at the K-12 level; by trying out teaching practices in authentic settings, teachers get feedback in the form of students' responses that they can compare to

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their assumptions about what they intended to happen. Their reflection upon this experience can change their points of view on what it takes to achieve the kind of learning outcomes they are intending.

Hence, the feedback that PTs receive from a teaching experience - both intrinsically as they react to the setting in the moment and extrinsically as they receive feedback from a mentor or peer – is critical to changing their point of view. Yet the kind of feedback they receive is largely dependent upon the context in which they teach. For example, in a microteaching setting involving teaching to one's peers, PTs are more likely to accurately anticipate the outcome of their teaching moves, and, thus, the intrinsic feedback will be affirmative. Thus, if mathematics teacher educators want to shift PTs' points of view on what it takes to teach in ambitious ways for all learners (Lampert, Boerst & Graziani, 2011), we need to ensure that the context in which they practice ambitious teaching offers an opportunity to get feedback that is representative of the kind of student responses they would receive in K-12 instructional settings.

The emerging research on rehearsals, where PTs rehearse scripted teaching moves in short instructional episodes (Kazemi, Ghousseini, Cunard & Turrou, 2015; Kazemi, Franke & Lampert, 2009; Lampert, Franke, Kazemi, Ghousseini, Turrou, Beasley, Cunard & Crowe, 2013), is moving the field forward in developing teacher education that helps PTs to enact particular teaching practices. Our claim is that the UTE model, like rehearsals, offer PTs an opportunity to ground their learning of how to do particular teaching practices, but in a setting that helps them develop an understanding of what it will take to carry out those practices in live classrooms. A key driver for this situated understanding is the involvement of mathematics teacher educators in providing ongoing instructional support to the PTs in the UTE. Although this support may be more involved than what PTs would normally receive from a mentor teacher in a school-based placement, it is critical support at this stage in their preparation to help them to reflect upon their instructional decision making as they grapple with multiple competing obligations.

## Methods

Participants were 19 PTs enrolled in their first semester-long course on mathematics pedagogy (Methods I) in a large teacher preparation program at a Midwestern University. The Methods I course included a three-hour seminar meeting per week, a four-hour school-based placement experience per week, and a two-hour commitment to participating in the UTE per week. Each PT co-taught a lesson in the UTE twice during the course of the semester. Prior to UTE teaching, each pair received a packet with tasks to be completed during the lesson. Then, each pair submitted three drafts of their lesson plan: (1) initial draft completed using the Thinking through a Lesson Protocol (Smith, Bill & Hughes, 2008); (2) revised draft based on feedback from MTE a week before teaching; and (3) revised draft after teaching the lesson in the UTE. To address the research questions, we collected video-recordings of PTs' teaching in the UTE, along with the lesson plan drafts they completed related to their UTE teaching. The results we share in this paper focus on analyses of the first and revised drafts of the lesson plan. We also conducted semi-structured interviews with 11 PTs, who volunteered to be interviewed from the larger sample of 24 PTs, to learn about their perceptions of the value of the UTE for their learning to teach, as well as their reflections on its affordances and constraints as compared to their school-based placement experience. Additional information about the analyses of these data sources will be presented in the Results section.

## Results

We will present the results in three parts, with each part corresponding to one of our three research questions: (1) *To what extent does the UTE support the development of PTs' planning for attending to student thinking as evidenced in their written lesson plans for UTE lessons?* (2) *To what* *extent do PTs teach in the remedial math course in ways consistent with the methods and strategies to promote mathematical proficiency?* and (3) *How do PTs evaluate the opportunities to learn in the UTE and how do they compare those experiences to their work in a school-based placement during the second semester?*

**Quality of PTs' Teaching in the UTE**

To assess the overall quality of PTs' instruction with respect to promoting mathematical proficiency, we rated the video-recorded observations using the Instructional Quality Assessment (IQA, Boston, 2012) across two dimensions: Implementation of the Task and Student Discussion Following the Task. The rating scale for the Implementation of the Task dimension is based on the levels of cognitive demand (Stein, Grover & Henningsen, 1996), with ratings from 0 to 4 where a 4 rating indicates that:

> "Students engaged in exploring and understanding the nature of mathematical concepts, procedures, and/or relationships, such as: Doing mathematics: using complex and non-algorithmic thinking (i.e., there is not a predictable, well-rehearsed approach or pathway explicitly suggested by the task, task instructions, or a worked-out example); OR Procedures with connections: applying a broad general procedure that remains closely connected to mathematical concepts." (Boston, 2012, pg. 9)

The Student Discussion Following the Task rubric complements the Implementation of the Task rubric by focusing in on the question: "To what extent did students show their work and explain their thinking about the important mathematical content?" (Boston, 2012, p.10). Similarly to the Implementation of the Task rubric, the scale ranges from 0 to 4 with a Level 4 rating indicating:

> "Students show/describe written work for solving a task and/or engage in a discussion of the important mathematical ideas in the task. During the discussion, students provide complete and thorough explanations of why their strategy, idea, or procedure is valid; students explain why their strategy works and/or is appropriate for the problem; students make connections to the underlying mathematical ideas (e.g., "I divided because we needed equal groups"). OR Students show/discuss more than one strategy or representation for solving the task, provide explanations of why the different strategies/representations were used to solve the task, *and/or make connections between strategies or representations."* (Boston, 2012, p. 10)

Raters were trained to use the IQA rubric prior to rating, and achieved an inter-rater reliability in their scoring (within .5 rating points) of 95% on a sample of 5 lessons of 17 total lessons collected. The rating rubric follows a scale from 1-4, without half-point increments. As there were 19 PTs, there were a total of 8 pairs and one team of 3 PTs. Because some pairs were reorganized during the second round of UTE teaching, we selected only the first and second UTE teaching episodes that were taught by the same pairs of students each time. Thus, a total of 6 pairs of teaching episodes, or 12 total lessons, were analyzed for these results.

**Table 1: Aggregated Mean IQA Rating**

| | Pair 1 | Pair 2 | Pair 3 | Pair 4 | Pair 5 | Pair 6 |
|---|---|---|---|---|---|---|
| First UTE | 2 | 3.5 | 4 | 2 | 2 | 4 |
| Second UTE | 4 | 3 | 3.5 | 2.5 | 2 | 3 |

Table 1 provides the aggregated mean scores for each episode, combining ratings for Implementation of the Task and Student Discussion Following the Task. The aggregated score is appropriate as no episode had a difference greater than 1 point in the ratings for each dimension. The table shows two findings of interest. First, for the majority of episodes, PTs' instruction rated at least at a level of 3,

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indicative of teaching that promotes some level of conceptual understanding. Second, there are no significant patterns in the ratings from the first UTE to the second UTE observation. While two of the pairs improved in their aggregate scores, four pairs either remained the same or received lower ratings.

**Growth in PTs' Planning to Attend to Student Thinking**

Given that the likelihood of PTs' teaching significantly improving over the course of several weeks during the semester is low, we also analyzed PTs' lesson plan drafts for their first and second UTE teaching to determine whether specific lesson planning practices were improving as a result of the UTE mentoring. We focused our analysis on how PTs planned to attend and respond to student thinking as evidenced in their lesson plan drafts. Table 2 provides the coding scheme we developed from an iterative coding process (Strauss & Corbin, 1998) as well as examples for each of the codes. Two researchers coded a sample of lesson plan drafts for IRR. The agreement of what was to be coded from the lesson plans was 89%, whereas agreement regarding the assignment of the categories reached 65%.

After category codes were assigned to the text, the text was also scored for quality using a 4-point rubric (0 = is not mentioned; 1 = vague/generic, 2 = somewhat specific, and 3 = mathematically specific). We used three values to summarize the data. The *total quantity* was determined by counting the total number of coded instances. The *total quality* was calculated by adding the individual scores of codes. The *quality average* was computed by dividing the quality total for the lesson by the quantity to get an "average" response across all instances. In this paper, we focus on reporting the quality average.

**Table 2: Categories Coded in Lesson Plan Drafts**

| Category | Example text from a PT Lesson Plan |
|---|---|
| Predictions of students' mathematical thinking | *seeing them write f(x)=???? will be how I know they're putting the pieces together* |
| Students' mathematical talk | *hearing students talk about inputs of functions and outputs of functions related to my, or their, examples* |
| Questions students might ask | *students may ask how these extraneous solutions affect the equation's graph* |
| Student misconception/difficulty | *students may not realize that 'consecutive odd integers' means that the unknown has to be defined as x and x+2* |
| Student prior knowledge | *students should be familiar and comfortable with the box method for factoring.* |
| Student learning outcomes | *I want students to walk away from this lesson looking at mathematical functions like they're operations and tasks rather than random grouping of numbers/letters/symbols* |

Figure 1 below shows results in the form of average quality scores for the entire sample, across lesson plan drafts and disaggregated by category type. Across nearly all categories, quality scores increased from the first UTE to the second UTE teaching experience. And, not surprisingly, the final drafts for each UTE teaching (Lesson Plan 2 and 4, respectively) had higher quality instances of planning related to attending to student thinking than initial drafts (Lesson Plans 1 and 3). However, it is interesting to note that the quality of evidence linked to predictions of students' mathematical thinking and questions students might ask decreased, somewhat, from Lesson Plan 3 to Lesson Plan 4. This may have happened because, as the math became more challenging in the remedial class, PTs downgraded their expectations in the revised drafts based on experiences with students during the lesson enactment.

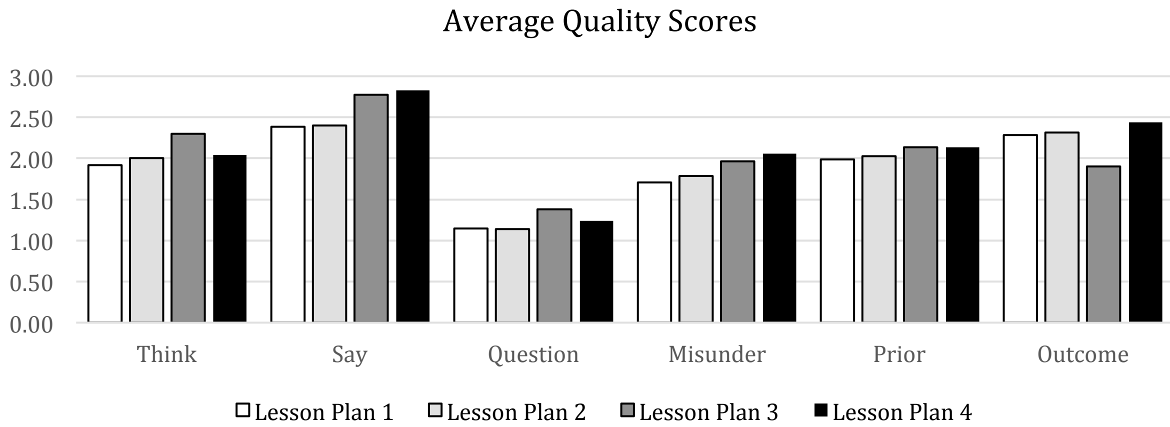


**Figure 1.** Average quality scores for each category across drafts.

**PTs' Perceptions of Learning to Teach in the UTE**

Finally, we share results from analyses of interviews with PTs who voluntarily agreed to participate in semi-structured interviews to learn more about their experiences in the UTE. We asked questions such as*: What aspects of the experience did you find useful? What did you learn from observing others teach and taking observation notes? Did the MTL experience influence your work in doing the slices of teaching and lesson studies in your placement classroom?* The interviews were audiorecorded and then transcribed. For select questions, the transcribed responses were coded at the phrase level to capture what participants stated they had learned from participating in the MTL experience (a "what" code) and for how participants stated they had learned these lessons (a "how" code). Using an iterative coding process following methods of grounded theory (Strauss & Corbin, 1998), four codes emerged for "what" was learned (teacher moves, comfort in the classroom, specific discussion strategies, and lesson planning) and four codes emerged for "how" those aspects of teaching were learned (UTE teaching, observing peers in UTE, lesson planning in UTE, peer feedback after UTE).

Not surprisingly, participants most commonly reported that doing teaching in the UTE was the most beneficial aspect for their learning to teach. But, when asked why they felt teaching in the UTE was beneficial, many acknowledged the importance of the support they received while teaching in the UTE. As one participant pointed out, the UTE allowed her to teach "with the guidance of someone there you know well enough to jump in and save you if needed." Another pointed out that working with undergraduate students allowed her to teach "real life students" that "aren't gonna fail if you mess up." However, this pointing to the supportive environment was not universal; other participants stated that they saw any teaching as beneficial to them, and the UTE was just another place to practice teaching, with no special emphasis on the environment. As one participant put it, "the benefit of UTE is getting some experience under you belt, um, kind of getting to know a little bit about yourself as a teacher."

The two most common aspects of teaching the PTs reported learning in UTE were comfort in the classroom and specific discussion strategies. Because teaching in the UTE was among the first teaching experience for most of the PTs, many reported that teaching in the UTE helped them gain some confidence in the classroom. PTs also reported learning how to facilitate whole-class discussions by implementing them while teaching in the UTE. This aspect was discussed as an affordance that the UTE provided that the school-based placement did not. As a PT stated: "in my placement class, um, I don't think the teacher would have stepped in unless it was a real like, um, train wreck, I guess? Um, meanwhile [Kristen] or the TAs in the UTE would be willing to step in for smaller things, just like, hey, think about this, or whisper in our ears, hey, think about this." Most of the participants reported similar positive gains in learning to implement discussion-based lessons from the help and support given by instructors during their teaching experiences in the UTE, including the modeling of discussion-based practices by the MTEs early in the semester. This opportunity in implement discussion-based instruction was especially valuable for participants who were later placed in classrooms with teachers who were resistant to using discussion-based instructional practices.

Finally, most PTs reported learning about teaching strategies from watching their peers in UTE, an affordance of the model that school-based placements are unable to offer. Of the 19 instances of participants reporting having learned some sort of teaching strategy, 15 reported learning them from peer feedback or from observation peers. Participants reported favorable on observing and being observed by peers primarily because of the various teaching skills they learned from each other. In looking at the times participants reported learning something from either observing peers or receiving peer feedback, there were only 2 out of the 17 combined instances that participants did not report learning teaching skills.

## Concluding Remarks

Taken together, the analyses of data sources suggest that the UTE experience affords PTs with an opportunity to learn about the complexities of teaching in a supportive environment where they can attempt practices such as facilitating whole-class discussions. Findings from our analyses of the quality of PTs' instruction show that, on average, the quality of instruction is often better than what the literature typically characterizes the nature of teaching in remedial, non-credit, mathematics courses (Larnell, 2016). While the observation ratings show that overall quality does not markedly improve for PTs over the course of the semester, the analysis of lesson planning artifacts reveals that PTs do improve over time in their preparation to attend to student thinking – a high-leverage teaching practice (NCTM, 2014).

Does the UTE model provide better opportunities for PTs to learn from, and within, teaching (Lampert, 2010) than school-based EFEs? Evidence from participants' reflections about both EFEs in the interviews suggests that the curriculum of the UTE, the structure of the setting, and the mentoring provided by MTEs may provide better access for all PTs to engage in student-centered teaching practices such as leading whole-class discussions. Moreover, the PTs mentioned that opportunities to reflect on their peers' instruction, which rarely happens in typical EFEs where PTs are placed one-on-one or as a pair with a mentor teacher, was an important aspect of their learning in the UTE. Although the design of this initial study into the effectiveness of the UTE model as a EFE cannot definitively address whether the UTE model provides better opportunities for learning about teaching practice than school-based EFEs, the evidence suggests it is a promising model that would benefit from wider implementation to assess its impact on PTs preparation for the challenges of teaching mathematics in school settings.

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