Exploring links between beginning UTeachers' beliefs and observed classroom practices

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What makes a tennis player good?

A good serve.

Practice serve.

Teacher Preparation

- Many of us play some role in preparing future teachers
- Some of the same ideas about Teaching Practices and Teacher Beliefs come up in discussing teacher preparation.

Teaching Practices

- Teacher preparation
  - Programs frequently have ideals about teaching, or a theoretical framework about what exemplifies or characterizes good teaching
  - Programs aim to prepare teachers to teach according to these underlying ideas about education

Teaching Practices

- Impact of teacher preparation on teachers practices, particularly reform implementation
  - Various research projects report that university courses were of little value for changing teachers' classroom approach to be more conceptual; methods courses were often too theoretical (Brown & Borko, 1992) and experience teaching was viewed as the real source of learning to teach (Wilson, et. al, 2005)
  - Frykholm (1999) notes that despite a commitment on the part of the mathematics education community towards standards-based reform, a mismatch between beginning teachers' knowledge of standards and their teaching practice exists. Ensor (2001) similarly noted this disconnect between preparation and generating good practice.
  - Mewborn (1999) notes that to combat preservice teachers' tendency to view methods as prescriptive, fostering *reflection* was a necessary aspect of preparation; Ebby (200) similarly discusses *developing habits of mind* to learn from classroom experiences.
- Often hard to change teaching practices to be in accordance with programs' theoretical framework of excellence in teaching.

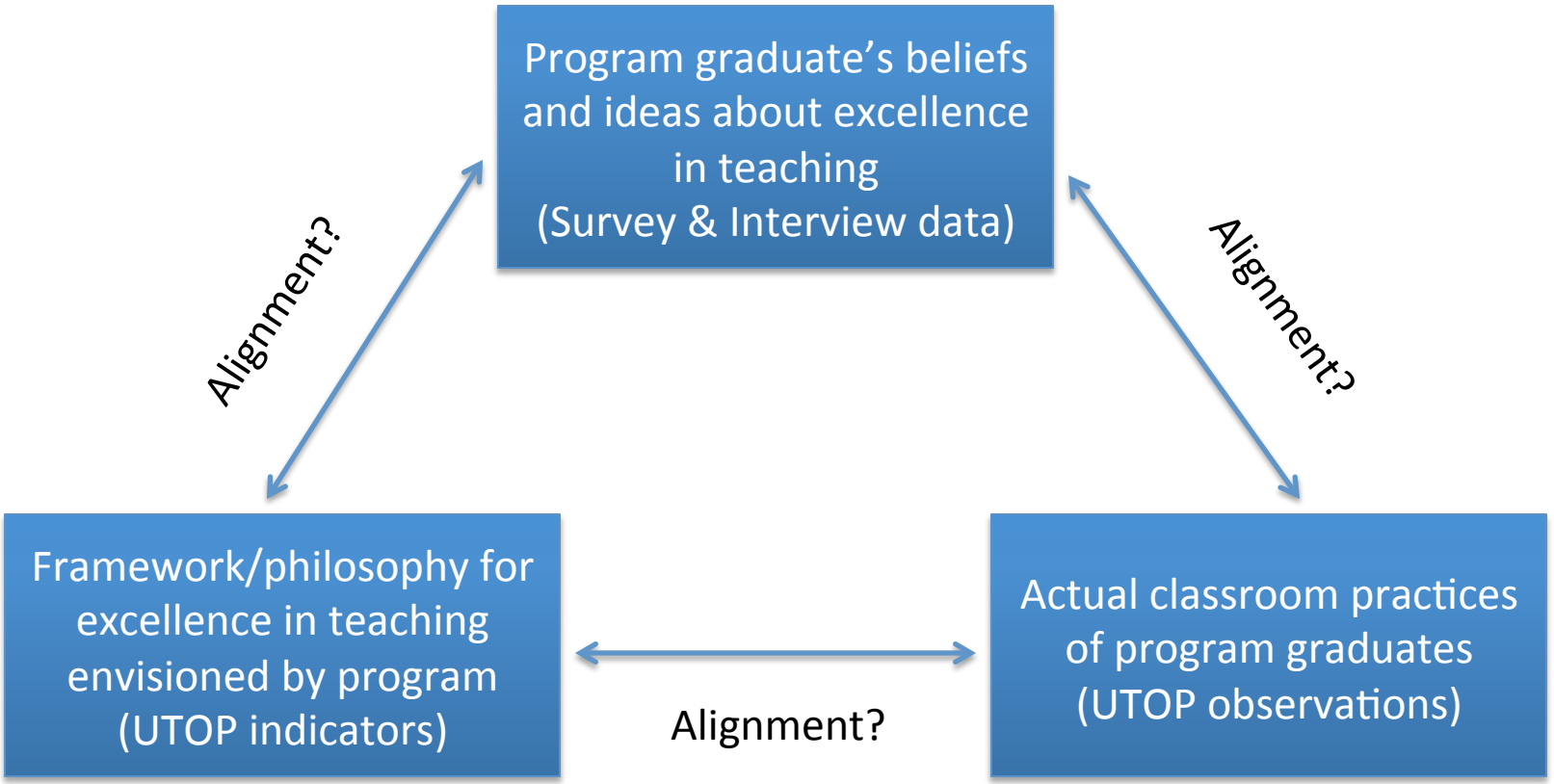
Teacher Beliefs

- Teacher Beliefs:
  - Beliefs are hard to change (Pajares, 1992) and are distinct from knowledge.
  - Teacher beliefs impact teaching practices, perhaps more than knowledge (Thompson, 1992; Pajares, 1992).
  - But there are also instances of inconsistency between teacher's espoused mathematics beliefs and teaching practice (e.g., Raymond, 1997)
    - Beliefs about: Nature of mathematics, Learning mathematics & Teaching mathematics, compared to their mathematics-teaching practices.
  - People can be unaware of their own beliefs (Furinghetti & Pehkonen, 2002).

Teacher Beliefs

- Impact of teacher preparation on teacher beliefs
  - Various studies report that preservice teachers show little change in beliefs after a teacher education program (e.g., Thompson, 1992; Cooney, 1999). In particular, teachers often assimilated new ideas to fit their existing schema.
  - However, more recently, others have found that teachers' beliefs (or at least their espoused beliefs) can change after a teacher education program, measured on various belief scales instruments (Fennema, et al, 1996; Hart, 2002; Wilkins & Brand, 2010)
  - Some study particularly compelling reasons that teachers' beliefs can change, such as by observing students' mathematical thinking and reasoning (Ambrose, 2004) or by reflecting on the effectiveness of their practices (Phillip, 2007)
- Perrin-Glorian, Deblois, and Robert (2008) reflect that research has shown that changing teachers' beliefs during the course of a preparation program about educational practice did not necessarily bring about a change in their teaching practices.

Three-pronged Framework

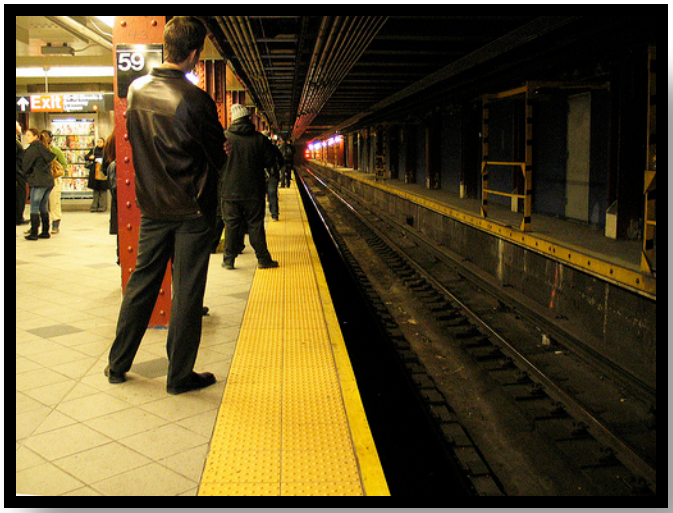


Rationale

- Teacher preparation programs cannot, and should not, attempt to teach everything a teacher needs to know before entering the profession.

  – Subway platform moments

  – What aspects should preparation programs focus on?



Rationale

- We argue that those attributes that beginning teachers espouse to be particularly useful for achieving excellent teaching are worth considering as **very important** for teacher education programs to include
  - Important because feeling successful likely improves teacher retention rates
  - These are attributes beginning teachers will strive for anyways – they are the "Andy Roddicks" of their beliefs about good instruction – which means teacher preparation programs should be all the more vigilant about addressing them – both for where they align and do not align
  - There can be weakness in self-reports from teachers only; use of observations contribute to more complete data
- Study of graduates of nationally replicating UTeach program may give particularly useful information about teacher preparation, both on beginning teachers' beliefs and practices

Research Question

To what degree are beginning UTeachers reports about the knowledge and instructional strategies that were influential to their teaching (Study 1) aligned with the instructional strategies that we observed in beginning UTeacher classrooms (Study 2)?

Quick Note

UTeachers beliefs about excellence in teaching	Related to UTeach framework (UTOP) of excellence in teaching	Observed practices and enactment (along UTOP instrument)	Reflection on teacher education
X	X	X	
X	X		
X		X	
X			
	X	X	
	X		
		X	

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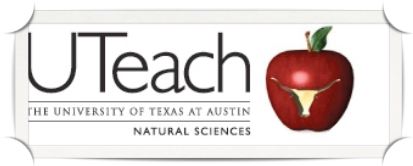
	X		
		X	

Quick Note

UTeachers beliefs about excellence in teaching	Related to UTeach framework (UTOP) of excellence in teaching	Observed practices and enactment (along UTOP instrument)	Reflection on teacher education
X	X	X	Useful aspect of program; influenced beliefs and practices
X	X		Need to better prepare teachers for implementation
X		X	Possibility for modification of framework
X			Possibility for modification of framework
	X	X	Possibly need to more fully address the underlying belief/theory behind the practice
	X		Possibility for continuing professional development
		X	Bad teaching habit

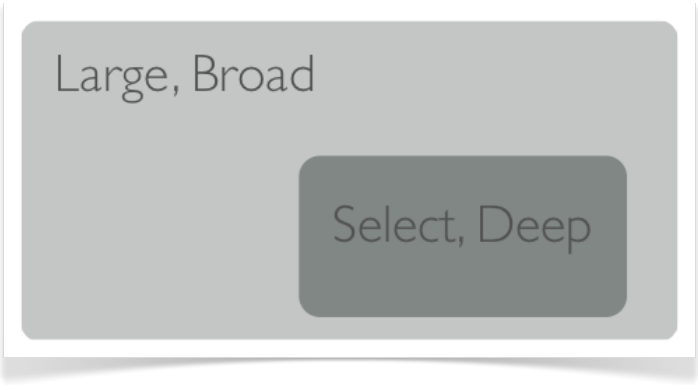
Method – Study 1

- Participants 

  - UTeach Math Graduates from Dec 2007, May 2008, Dec 2008, May 2009 (study conducted in May 2010 – beginning teachers b/w 1 and 2 years experience)
  - Surveys about beliefs and practices (Voluntary sample, N=37, of possible 49. A 75% response rate.)
  - Interviews (N=8; Selection criteria: nominations, math GPA, leadership)
- Data collection techniques
  - Internet survey responses; 1-hour in person interview with researcher, audio-recorded

Instruments – Study 1

- Survey
  - Created around literature related to excellence in teaching and classroom practices (broad scope); Pilot study (N=10)
  - Validity & Reliability: Cronbach's Alpha, a=~0.7; Test/ Retest; r=0.91
- Interviews
  - Intended to expand upon survey data and provide more detailed descriptions
  - Semi-structured interviews
- Mixed Methodology



Analysis – Study 1

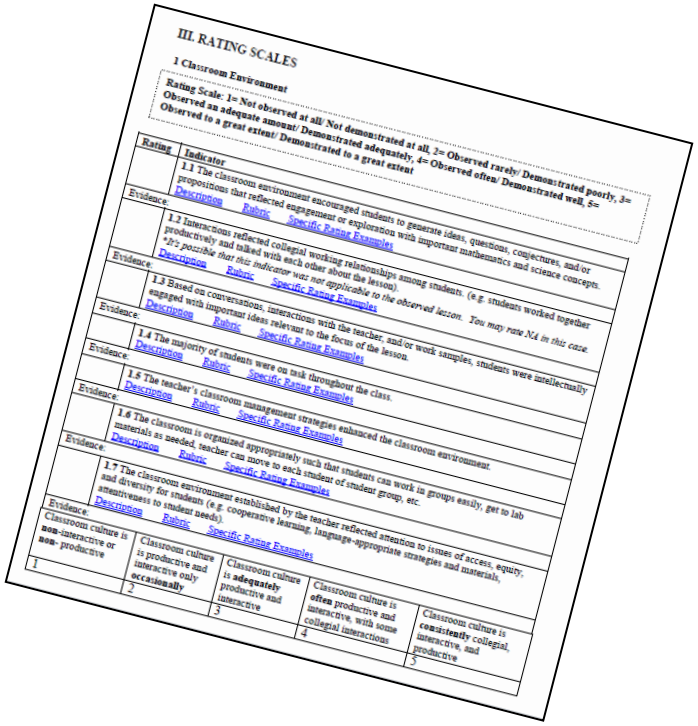
- Survey
  - Those attributes (based on responses to survey items) most commonly agreed upon by entire sample, using inferential statistics from data
  - PROVIDES: information about what attributes beginning UTeachers, as a whole, believe are important to their teaching and do in the classroom
- Interviews
  - Created coding framework from grounded theory approach (Strauss & Corbin, 1990), referencing extant literature
  - Comparative case analysis, between- and within-case (Yin, 1994); commonalities and differences in responses
  - PROVIDES: further detail about why those things are important and some of their specific thoughts, examples, and rationales

Method – Study 2

- Over 5 semesters, conducted 83 observation of 2 groups of teachers:
  - UTeach Graduates (N=21)
  - Non-UTeach Graduates (N=15)
- Novice teachers (0-3 years exp)
- Math, science, and computer science classes
- 9 high schools, 5 middle schools, 2 districts
- 50-90 minute observation, 1-2 times per semester
- 2 observers present

Instrument – Study 2

- 32 indicators (teaching behaviors) in 4 sections
  - Classroom Environment
  - Lesson Structure
  - Implementation
  - Mathematics/Science Content
- 1-5 scale, DK/NA options
- Supporting Evidence
- Section Synthesis Ratings
- Teacher interview
- Developed based on UTeach framework (portfolio expectations, apprentice teaching observations, etc.)



III. RATING SCALES

1 Classroom Environment

Rating Scale: 1= Not observed at all/ Not demonstrated at all, 2= Observed rarely/ Demonstrated poorly, 3= Observed an adequate amount/ Demonstrated adequately, 4= Observed often/ Demonstrated well, 5= Observed to a great extent/ Demonstrated to a great extent

Rating	Indicator
	1.1 The classroom environment encouraged students to generate ideas, questions, conjectures, and/or propositions that reflected engagement or exploration with important mathematics and science concepts. Description Rubric Specific Rating Examples
Evidence:	
	1.2 Interactions reflected collegial working relationships among students. (e.g. students worked together productively and talked with each other about the lesson) *If it is possible that this indicator was not applicable to the observed lesson. You may rate NA in this case.* Description Rubric Specific Rating Examples
Evidence:	
	1.3 Based on conversations, interactions with the teacher, and/or work samples, students were intellectually engaged with important ideas relevant to the focus of the lesson. Description Rubric Specific Rating Examples
Evidence:	
	1.4 The majority of students were on task throughout the class. Description Rubric Specific Rating Examples
Evidence:	
	1.5 The teacher's classroom management strategies enhanced the classroom environment. Description Rubric Specific Rating Examples
Evidence:	
	1.6 The classroom is organized appropriately such that students can work in groups easily, get to lab materials as needed, teacher can move to each student or student group, etc. Description Rubric Specific Rating Examples
Evidence:	
	1.7 The classroom environment established by the teacher reflected attention to issues of access, equity, and diversity for students (e.g. cooperative learning, language-appropriate strategies and materials, attentiveness to student needs). Description Rubric Specific Rating Examples
Evidence:	

Classroom culture is **non**-interactive or **non**- productive	Classroom culture is productive and interactive only **occasionally**	Classroom culture is **adequately** productive and interactive	Classroom culture is **often** productive and interactive, with some collegial interactions	Classroom culture is **consistently** collegial, interactive, and productive
1	2	3	4	5

UTOP and Online Manual

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UTOP and Online Manual

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This indicator should be rated a **1** if there is group work during the lesson, but the group work is highly unproductive. This could include behavior where the majority of the groups are socializing, off-task, arguing, or ignoring each other, as well as regular instances of students copying and/or certain group members doing all of the work.

This indicator should be rated a **2** if …

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Rating of 3 Example: The students were put into debate groups for this class period - one group would debate another group, while the rest of the student groups were in the audience. The groups worked together smoothly - the students were able to pick who was doing what part of the debate, coordinate their arguments, and split the time slots when necessary. The audience also would occasionally compare their notes during breaks…

Instrument – Study 2

- **Reliability**
  - Weighted kappa = 0.63
  - ICC: 2 observations per year, 2 observers present
- **Factor Structure**
  - Surface-Level Engagement, Intellectual Engagement, Content Knowledge, Content Connections
- **Value-added correlations**
  - Quite good, better than other widely-used instruments (Framework, MQI, CLASS – see MET, 2012)
  - Tests of conceptual understanding; attitudes

Analysis – Study 2

- Chose relevant UTOP indicators based on Study 1: behaviors UTeachers believed to be important
  - Numerical rating: mean, sd
  - Analyzed supporting evidence observer cited for each rating
- Constant comparative method (Glaser & Strauss, 1967) to develop codes for categories of evidence cited; multiple codes per block
  - Allowed us to understand qualitatively *why* scores were being assigned

Analysis – Study 2

Teacher Questioning Strategies:

Subject	Rating	Evidence	Codes
Biology	1	Teacher asked a couple factual questions (examples of materials that were part of the water cycle) during her brief impromptu lecture because of difficulties with content understanding. He otherwise did not use questioning strategies.	fact-based questions
Physics	3	One way this teacher used questioning to develop conceptual understanding is to asks students to predict what would happen when a ball rolled off a table – would it go straight down like Wiley coyote? Would it fall diagonally like a ramp? Or would the shape be curved like a parabola? Other than this, none of the questions were particularly higher-order. However, the teacher did call on non-volunteers several times, effectively using wait time. He also made good use of questioning strategies to diagnose student misconceptions about motion.	ask for predictions few higher-level appropriate wait time questioning to assess PK/misconceptions
Algebra	5	The teacher heavily used questioning strategies to identify students' conceptions and misconceptions, and build off of students' ideas. The teacher also appropriately used wait time and redirected and revised student contributions to create a coherent picture. The teacher also used mostly high-order questions, constantly insisting that students justify their answers and verbalize their math thinking.	questioning to assess PK/misconceptions appropriate wait time provide justification describe/discuss reasoning

Comparative Analysis

- **Study 1** - What beginning UTeachers *believe* to be important for excellence in teaching
- **Study 2** - How *observed practices* are in/ consistent with some of the major beliefs professed
- **Comparative Analysis** between 2 studies to inform teacher preparation, lending insights into how and what beginning teacher preparation programs might focus on

Results – Study 1

- We only discuss results from Study 1 that are particularly important for the comparative analysis at hand
- This means attending to some themes and dropping others
- Based on the previous chart, we selected a few representative examples from the two possible rows. These examples, more or less, had two themes:
  - Designing Lessons
  - Modifying Instruction
- In addition, we explore the role of Mathematics Content Knowledge

UTeachers beliefs about excellence in teaching	Related to UTeach framework (UTOP) of excellence in teaching	Observed practices and enactment (along UTOP instrument)	
X	X	X	Designing Lessons
X	X		Modifying Instruction

Results – Study 1

- Beginning teachers from this study reported that these aspects (among others) were important for and helped them achieve excellence in teaching
  - Designing Lessons that:
    - Are Inquiry-based and utilize real-world connections
    - Involve active student participation
  - Modifying Instruction by:
    - Supporting (intellectual) engagement
    - Using questioning strategies to elicit thinking
    - Responding flexibly to student needs
    - Paying attention to specific classroom contexts
  - Mathematics Content Knowledge

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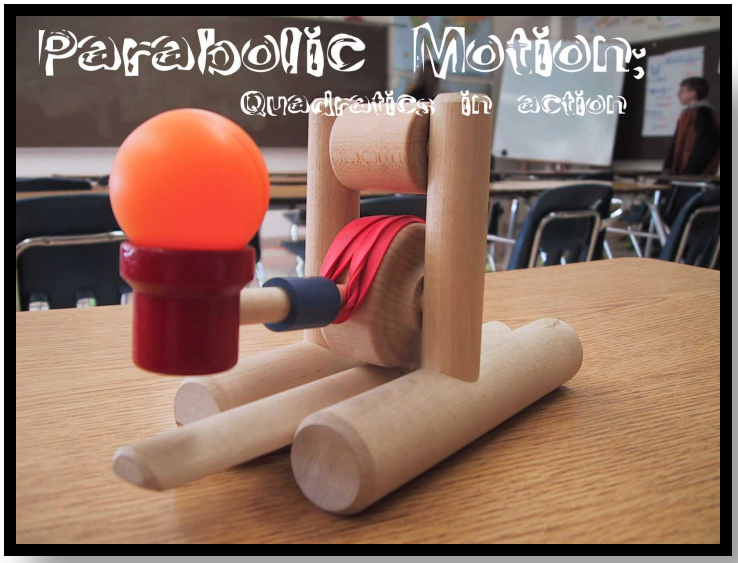
Evidence

"But I think naturally, without even thinking about it, when I'm planning how am I going to structure my lesson, without a doubt I think of how do I introduce this? aka, engage them? And then how do I let them try things on their own first, so I don't baby them every single step. So I think UTeach prepared me in structuring someway my lessons that way. Some way in a 5-E way." [Elisa]

"…but also within the activities, just doing inquiry-based, exploration-based activities constantly. A project is one big exploration-based activity…" [Ali]



"When we first started learning about periodic functions. I said, okay, let's take a ferris wheel. What's happening is the people are going around on the ferris wheel. What's their height in relation to time? So taking a real life situation that's kind of fun to begin with, but then starting to introduce some of the vocabulary, and then they don't even realize it but they're exploring all the main features of periodic functions…Not just simply telling them, oh well, this is the equation for an ellipse. But stopping to think about it. " [Julia]

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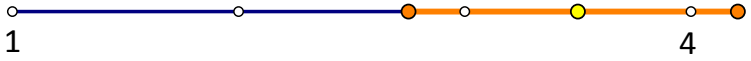
Evidence

Survey Data (Frequency (1-4) scale Likert items)

- You facilitate classroom discussions where students actively participate in the learning process as opposed to primarily teacher-presented information [Active Student Instruction] Mean: 3.50, St Dev: 0.76



"And I think that's a big backbone of UTeach. The idea of if you understand it, if you discover it, you'll remember it, you'll retain it." [Sarah]

"I've found what works best is setting up procedures and letting the kids be in control of their learning. And that is hard to do…And then if you set it up right, it should run itself." [Ali]

"Now I need to find a way for my hands on learner that needs to touch a conics section to understand what I'm talking about, as opposed to that drawing. I went through this whole thing in that lesson with cutting a cone of Styrofoam and all that. And then, oh, that's a conic, and they got it." [Abby]

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Evidence

Survey Data (Frequency (1-5) scale Likert items)

You engage students in thought provoking activities that involve mathematical reasoning and/or problem solving [Engaging Mathematical Activities] Mean: 3.13, St Dev: 0.99

"I think the UTeach structure completely changed my vision of what its like to be a teacher…Okay, so the first thing that, cause UTeach gave the 5-E lessons, and the first E is of course engage, and one of the things that they've emphasized here in their structure here, was you have to have a lesson to hook your kids. Cause if you don't hook them, then, especially here, you got 90 minutes." [Chris]

"And I'm always like, but, we need something cool at the start… I don't think you can really teach students without giving them some purpose which is the engagement." [Rebecca]

"Definitely, engaging lessons. To me that's kind of a means to an end for progress. That they're engaged in the lessons. That's something that me personally that's a big deal, and maybe that's just UTeach engrained it in my mind, that they've got to be engaged to be to maximize their learning. You can learn without being incredibly engaged, but its definitely going to be more effective with that." [Julia]

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Evidence

Survey Data (Frequency (1-4) scale Likert items)

You directly give answers when students have questions, as opposed to giving hints aimed towards helping students solve the problem themselves [Questioning Strategies] Mean: 1.97, St Dev: 0.55

"…now the questioning techniques that are embedded in my bag of tricks doesn't ever let a day turn into a straight lecture. I'm constantly interacting with these kids, and checking for understanding, and all of that…" [Abby]

"…Socratic method, which the school I went to in high school was a classically based education. So they called it that, but really what that is, is just the same thing as… discussion-based." [Julia]

"I hold them to the standard of I want them to be able to communicate and problem solve…So yea, maybe my level of success in the classroom is how many questions are asked to my classroom, or how much the level of questioning has not only increased over the year but has gone into higher order." [Ali]

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Evidence

Survey Data (Frequency (1-5) scale Likert items)

You are flexible and adaptive in your teaching – comfortable making decisions at the last moment based on what has actually happened, versus what was planned to have happened [Flexible/Adaptable] Mean: 4.27, St Dev: 0.65

"If I'm talking to someone, and I'm trying to help them…if I had that glazed look, and the staring right back at me, I knew I was doing something wrong. I needed to change it." [Rebecca]

"Cause your first year you have to be ready to go, this is not working, we've got to change right now in the middle of first period." [Ali]

"And so I go in kind of not necessarily with a blank slate, but I go with this belief that it's just a new day. You have to teach it, and anything can happen, so I need, myself, to be flexible. I tell myself that every morning…just don't go in with this one mindset. That this is how its going to be. Cause maybe I created this awesome lesson, that I think is awesome. But then the kids are like, this is stupid, this is boring. Why did you do this?...So I just say, go in kind of flexible…because of after everyday you realize that nothing will probably happen how you want it to." [Sarah]

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Survey Data (Frequency (1-4) scale Likert items)

You pay attention to the particular class of students that you teach while planning lessons, incorporating ideas that would be of specific interest to them [Contextualize]

Mean: 3.00, St Dev: 0.75

"So to come in here, and go, what I think is engaging and exciting is not necessarily what you know a 62% Hispanic population thinks is engaging. So then you learn…Cause the more you get to know your kids, you know more what they need and you start to get a better idea of what their lives are like, and what their day to day is, and when do they use math in this." [Ali]

"But then I think you have to make it your own, and make it your kids. Because what works in Ms. Moskit's class doesn't work for my kids." [Elisa]

"It was just a different environment. I think that was, most of my students were Hispanic and African American…Just their culture, compared to my culture. It just was eye-opening too, because it was just very different. And they would just talk about different things. And they're just really funny and loud…And kind of it was, just, to learn more about how I teach in, and how to adjust my teaching." [Sarah]

Results – Study 1

- Beginning teachers from this study reported that these aspects (among others) were important for and helped them achieve excellence in teaching
  - Designing Lessons that:
    - Are Inquiry-based and utilize real-world connections
    - Involve active student participation
  - Modifying Instruction by:
    - Supporting (intellectual) engagement
    - Using questioning strategies to elicit thinking
    - Responding flexibly to student needs
    - Paying attention to specific classroom contexts
  - Mathematics Content Knowledge

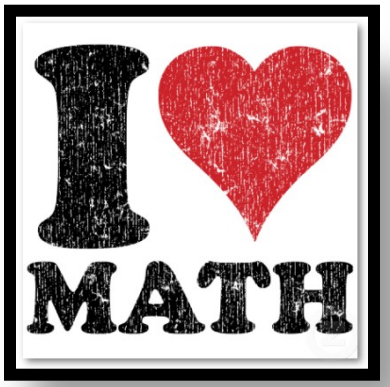
Evidence

Survey Data (Disagree/Agree (1-5) scale Likert items)

You feel confident in your mathematical knowledge to answer student questions that come up during class [Math Confidence] Mean: 4.86, St Dev: 0.35

You are a confident problem solver, able to solve novel problems [Problem-Solver] Mean: 4.51, St Dev: 0.56

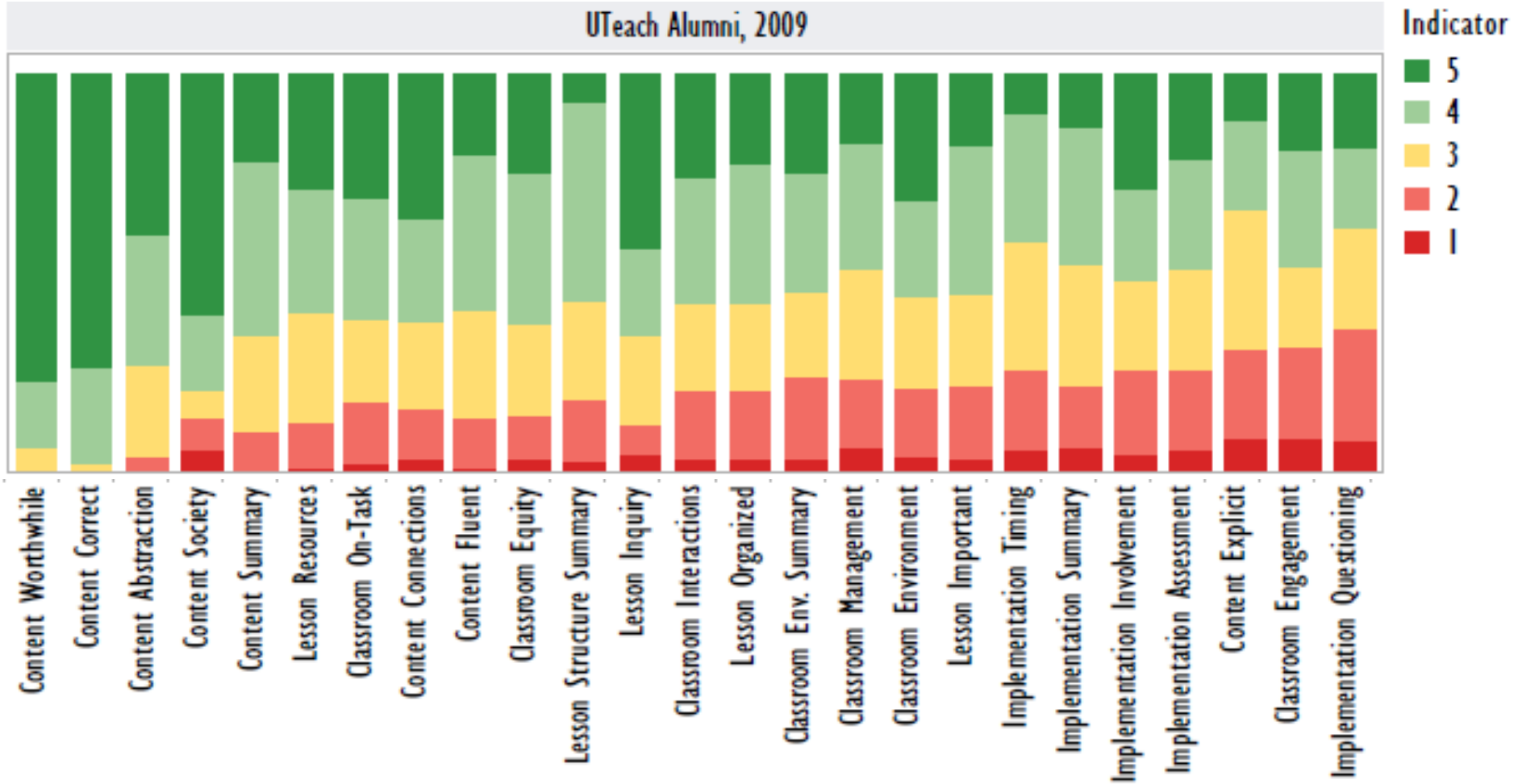
"I do feel like a strong content knowledge is key. They can smell it when they know you don't know a concept very well. They can, I swear they can. If you're not prepared, if you walk in and try to wing it and you're missing just a little hole, you'll have that kid that'll find it and that's for sure. So I think a strong content is very important." [Abby]



"I've seen [math] at a much higher level than we're going to teach it obviously, but it gives me background knowledge and confidence to where I can teach it." [Chris]

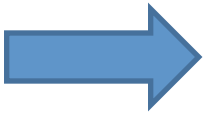
"…cause you have to understand the math in order to come up with activities unless you just want random stuff. But if you want more in depth, connecting stuff, you need to have the math content. You need to understand how things connect before kids are going to ever understand it." [Erin]

S2: Results - Overview



S2: Results – Designing Lessons

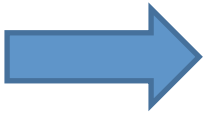
- Many UTeachers exceled at designing activities in advance that:
  - **Were Inquiry-based** (mean = 3.3, sd = 1.5)



- Project/problem-based instruction (7)
- Discovery learning/exploration (15)
- Labs/experiments (11)
- Argumentation/justification/ collaboration/role-playing (12)

S2: Results – Designing Lessons

- Many UTeachers exceled at designing activities in advance that:
  - **Were Inquiry-based** (mean = 3.3, sd = 1.5)
  - **Utilized real-world connections** (mean = 3.2, sd = 1.3)



- No connections (9)
- Story problems (9)
- Real world illustration of concept – often (7)
- PBI (6)
- Real world motivation (5)

S2: Results – Designing Lessons

- Many UTeachers exceled at designing activities in advance that:
  - **Were Inquiry-based** (mean = 3.3, sd = 1.5)
  - **Utilized real-world connections** (mean = 3.2, sd = 1.3)
  - **Involved active student participation** (mean = 3.2, sd = 1.4)

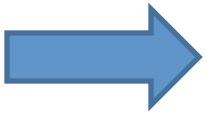
S2: Evidence – Designing Lessons

"The lesson allowed students to engage with this content – the teacher used demonstrations of throwing and rolling a ball he had with him, and also showed a video of a motorcycle acting as a projectile. He used interesting real-life examples, and called for student input often when setting up the examples."

"This project was situated in the real-world context of making math and science related decisions about a band's performance at South by Southwest. Students had to create a merchandize plan using inequalities, design the stage using geometry, set up a lighting system using circuits and light bulb efficiency, and much more."

S2: Results – Modifying Instruction

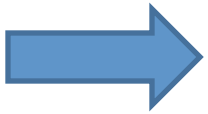
- UTeachers were less successful at modifying instruction in the moment by:
  - **Using questioning strategies to elicit thinking** (mean = 2.6, sd = 1.2)



- Fact-based questions (16)
- No higher-level questions (11)
- Questioning to assess PK (8)
- Scaffolding questions (8)

S2: Results – Modifying Instruction

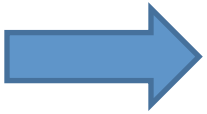
- UTeachers were less successful at modifying instruction in the moment by:
  - **Using questioning strategies to elicit thinking** (mean = 2.6, sd = 1.2)
  - **Responding flexibly to student needs** (mean=2.7, sd = 1.3)



- No modifications (11)
- No modifications with missed opportunity (7)
- Pacing – more time (8)

S2: Results – Modifying Instruction

- UTeachers were less successful at modifying instruction in the moment by:
  - **Using questioning strategies to elicit thinking** (mean = 2.6, sd = 1.2)
  - **Responding flexibly to student needs** (mean=2.7, sd = 1.3)
  - **Soliciting intellectual engagement with the content** (mean=2.8, sd= 1.3)



- No intellectual engagement (11)
- Students confused (8)
- Contribute strategies (8)

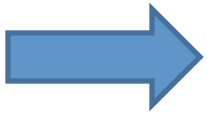
S2: Evidence – Modifying Instruction

"When assisting the students one-on-one or working with the students in the whole-class environment, the teacher focused on instructing the students rather than having them discover concepts through questioning. All of the questioning the teacher did do was very simple "fill-in-the-blank" type questioning."

"The teacher did not make modifications to make sure the students understood the material. When students did not understand, she would just say 'You know where you can find the answer to this - the reading' rather than ask them probing questions."

S2 Results: Paying Attention to Context

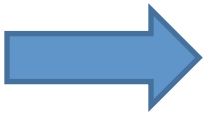
- **Paying attention to issues of equity, diversity, and access ("special needs")** (mean = 3.3, sd=1.2)



- Cooperative learning (15)
- Used multiple media (6)
- Special ed/weak in math (7)
- Open/relaxed environment (7)
- ESL (4)

S2: Results – Content Knowledge

- UTeachers showed their content knowledge through:
  - **Accurate written content** (mean = 4.9, sd = 0.6)
  - **Worthwhile content** (mean = 4.7, sd = 0.68)
  - **Appropriate use of abstraction** (mean=3.8, sd=1)
  - **Fluid communication of content** (mean=3.1, sd= 1.2)



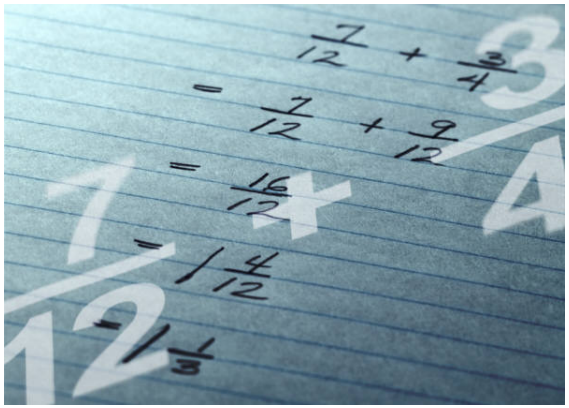
- Poor questioning/ scaffolding (16)
- Questions to guide learning (15)
- Fluid explanations (14)

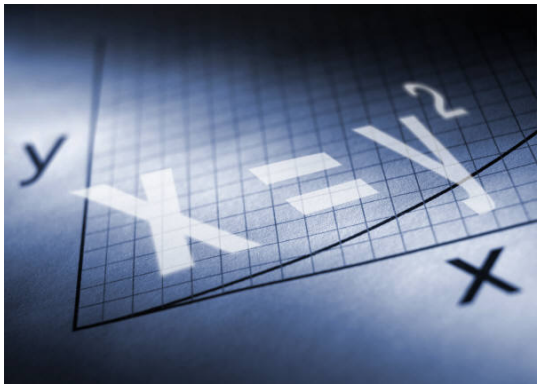
S2: Results – Content Knowledge

- UTeachers showed their content knowledge through:
  - **Accurate written content** (mean = 4.9, sd = 0.6)
  - **Worthwhile content** (mean = 4.7, sd = 0.68)
  - **Appropriate use of abstraction** (mean=3.8, sd=1)
  - **Fluid communication of content** (mean=3.1, sd= 1.2)
  - **Connecting content to "big picture" – making importance explicit** (mean = 2.4, sd = 1.5)

S2: Evidence – Content Knowledge

"The teacher used questioning extensively during the lesson, and this questioning reflected his content knowledge on ratios as well as his understanding of how to guide students from their misconceptions. The teacher explained concepts, such as why a fraction line should be horizontal, but more often used his content knowledge to guide students' explanations in the proper direction."





"The teacher said that solving systems of equations was an important skill for students to have to solve any problem where more than one relationship was involved. The teacher said that she did not go over this aspect of the "big picture" with her students, but that she did tell them it was on the TAKS test, which is the "big picture" for them. "

Summary – Studies 1 and 2

- Designing Lessons
  - Overall, beginning UTeachers valued designing lessons and instruction that were: Inquiry-Based; connected to the real-world; and actively involving students
    - Beginning UTeachers also excelled in enacting these lessons in the classroom

Summary – Studies 1 and 2

- Designing Lessons
  - These are often what programs try to focus on, giving ideas about theory, lesson plan design, specific strategies to use or try out, etc.
  - This is also something the UTeach program did evidently well – effected students' beliefs and their practices in observable ways
    - Perhaps it was teachers' modeling of this instruction that made this happen
    - "…it wasn't just here is a bunch of methods. The more, the further I went into the UTeach program, I realized that they were using the methods on us. That we were learning in the ways that they were teaching us to learn. And so I appreciated that and got to see the real impact of inquiry-based learning and the power it can have because I had been taught by so many lecture styles." [Abby]
    - "And so people like Allen Ingles and Garrett Locke at UTeach, not so much… their classes, but more witnessing them teach their classes made a huge difference." [Elisa]

Summary – Studies 1 and 2

- Modifying Instruction
  - Overall, beginning UTeachers valued being able to modify lessons and instruction by: Supporting intellectual engagement; Using questioning strategies to elicit thinking; and Responding flexibly to student needs
    - However, beginning UTeachers were not always able to enact these types of modifications well in the classroom
  - They also valued being able to modify lessons and instruction by: Paying attention to specific classroom contexts
    - Beginning UTeachers were adept at addressing specific issues of equity related to low/high/special ed/ESL populations
    - However, their descriptions of contextualizing lessons also included other, more relational, components of teaching

Summary – Studies 1 and 2

- Modifying Instruction
  - Became clear to teachers that this was a very IMPORTANT aspect of teaching, that helps them with success in the classroom
    - Something learned during long term teaching (not even during student teaching); while potentially emphasized in the program, maybe there's not many opportunities to actually practice it with feedback…
  - However, despite their belief that this helped them, they were also not very successful at implementing it
    - Could be because: beginning teachers sample; program does not emphasize it; it is very difficult… we don't have words, practices, in education to understand what goes on in the moment and why teachers make the choices they do
  - However, because they espouse its importance, it is necessary that teacher preparation programs and continuing professional development begin to find ways to help teacher excel at modifying instruction in the moment
    - E.g. altering instruction to audience response (formative assessment);
    - E.g. responding to student questions; soliciting their thinking
    - E.g. contextualizing lesson to specific students' needs and interests
    - E.g. video analysis or self-UTOP evaluations

Summary – Studies 1 and 2

- Mathematics Content Knowledge
  - Overall, beginning UTeachers valued having strong content knowledge
    - Beginning UTeachers also excelled in content areas; specifically, they choose worthwhile content for their lessons, the content is technically correct, they use abstractions well, and they make good connections to society
    - However, UTeachers also struggle to make it explicit why the content is important to learn, and structuring a lesson such that the big-picture became uncovered. (e.g., connections between content, importance)
  - This informs the importance of keeping big picture 8-12 mathematics content at the heart of teacher preparation; as well as reinforcing effective communication of mathematics
    - Relates to High-Leverage teaching practices – working toward proficient mathematical explanations
    - While they did not make computational errors, UTeachers also were not always efficient with connecting to big ideas or making important concepts comprehensible

Summary – Studies 1 and 2

UTeachers beliefs about excellence in teaching	Related to UTeach framework (UTOP) of excellence in teaching	Observed practices and enactment (along UTOP instrument)	Reflection on teacher education
X	X	X	Useful aspect of program; influenced beliefs and practices
• Designing lessons that were: Inquiry-Based; connected to the real-world; and actively involving students • Able to modify instruction by: Paying attention to specific classroom contexts (related to issues of equity)			
X	X		Need to better prepare teachers for implementation
• Able to modify instruction by: Supporting intellectually engagement; Using questioning strategies to elicit thinking; Responding flexibly to student needs; and Paying attention to specific classroom contexts (related to more relational components of teaching)			
X			Possibility for modification of framework
• E.g., Experimenting with different teaching strategies; Being Hard-working			
	X	X	Possibly need to more fully address the underlying belief/theory behind the practice
• E.g., Such as choosing and utilizing resources for their lessons effectively			
	X		Possibility for continuing professional development
• E.g., Effective implementation of lesson timing			

Implications

- Overall…
  - Alignment of **beliefs**, **practices**, and **philosophies** informs how teacher preparation can best serve teachers – support transition
  - Need better understanding of Content Knowledge and how best to facilitate learning of important content for the demands of teaching
  - Continue helping students understand both the theory and the practice involved in designing instruction
  - Also find relevant ways to help teachers learn to modify instruction in the moment, and tailor lessons to students interests and needs
- What beginning teachers' **believe** to be important influences their **actual classroom teaching** - include their perspective when determining which aspects of teacher education to focus on

Brainstorm

- How can we support students in learning to modify instruction in the moment? (e.g., intellectual engagement, questioning strategies, responding flexibly, attending to context)
- How can this be built into UTeach?
- What is it about the UTeach program that allowed them to take to the theory and practice it? (e.g., inquiry-based, active participation, real-world)

Summarize/Formalize

- Summarize main points based on discussion