FROM UTA TO PST:
TWO STUDENTS' PATHS
FROM SCIENTIST TO TEACHER

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Challenge

- Need for more highly-qualified science teachers

  (Ingersoll & Perda, 2010; National Academies, 2007; National Commission on Math and Science Teaching for the 21st Century, 2000)

- Historically, college graduates who become math and science teachers have reported lower college academic achievement and less rigorous math and science preparation than graduates who go into other professions.

  (National Science Board, 2006)

- Most science, math, and engineering graduates are unprepared for the demands of teaching, nor are they encouraged to consider teaching as a profession.

  (Otero, Finkelstein, McCray, & Pollock, 2006)

Addressing the Challenge:
Opening Doors and Taking Initial Steps Together

- Program[1] was designed to prepare and support undergraduate teaching assistants (UTAs) in introductory-level science, math or engineering courses.

- One outcome: Two of our science-major UTAs have decided to become secondary science teachers.

- We are interested in understanding how this program opens this door and starts highly-qualified STEM graduates on science teaching career paths.

[1]**PRIMES = Partnership for Retention Improvement in Math, Engineering, and Science**

UTA Program Description

Opening doors:
- UTA stipend
- Within-department STEM faculty screening applicants
- Build experience for future STEM teaching (graduate TA, prof)
- Appeal to personal desire for making a meaningful difference

Taking the first steps together
- Within-dept. cohort structure with senior dept. faculty
- Active participation of education faculty with STEM faculty (multiple knowledge bases)
- Kickoff workshop to bring coherence and purpose to the program
- Regularly scheduled seminars throughout semester
- Structured reflections with sharing and learning opportunities

Theoretical Framework
Social Cognitive Career Theory
(Lent, Brown, and Hackett, 1994)
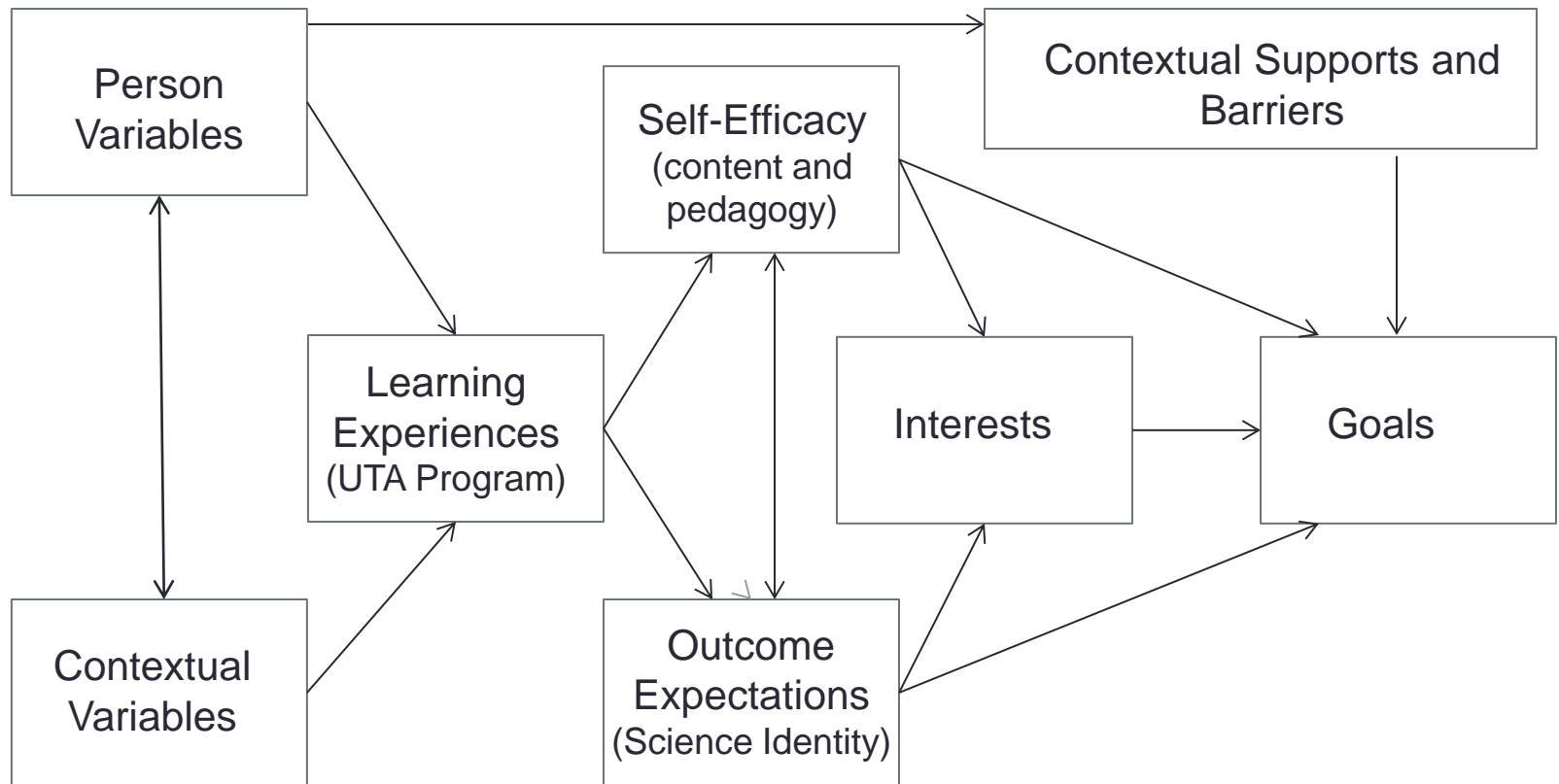
Research Questions

1. How has the focus on learning to be an effective UTA and the experience of working with entry-level STEM students encouraged UTAs to <u>consider science teaching</u> as a career choice?

2. Which experiences as a UTA helped the UTA to deepen their <u>content knowledge for teaching</u>?

3. How has the <u>science identity</u> of the UTA changed as a result of the UTA experience?

Methods

Research Design: Multiple Case Study

Data Collection

- <u>Six reflections</u> over the semester on using strategies such as guiding questions, formative assessment, metacognition, and a summary of their experience

- <u>Interviews</u> with the UTAs and their senior instructors

- End of semester <u>survey</u> about content knowledge growth, development of teaching skills and strengthening of communication skills

Methods

Variables

Lynda (pseudonym)

Person Variables

- Chemistry major
- 2nd semester UTA
- Married

Contextual Variables

- UTA context = recitation
- Significant others' support for science and teaching

Cheryl (pseudonym)

Person Variables

- Physics/physics ed major
- 1st semester UTA
- Initially engineering major

Contextual Variables

- UTA context = lab
- Initial lack of support for teaching

Findings: RQ1. Consider science teaching as a career

Theme	Lynda	Cheryl
Internal first steps on teaching path: Confidence as teacher	"Seeing students have a 'light-bulb moment' ….gives me confidence I could do it again."	[after 2 labs] "to really develop confidence… and then I would see a light-bulb go off."
External first steps on teaching path: Responsibility to students	[without a UTA, many students would be drowning in content but] "It's not OK to let people drown"	"I realized how heavily reliant my students were on me…and realized the responsibility I held."
Career interest	[without UTA program] "I would not have considered teaching"	[prior to UTA program] "I really wanted to major in education when I was in high school." [switched from engineering to physics education major]

Findings: RQ2. Content knowledge for teaching

Theme	Lynda	Cheryl
Refreshing the basics	"As I went through the course as a TA, things that I struggled with as a student just sort of 'clicked' and actually helped me with my upper level courses."	[preparing for lab] "helped me relearn the basics so I could understand the level of thinking my students were on."
Learning how people learn	"I definitely have a better understanding of different types of learning"	"I know that as a student myself, there are only specific ways that I can fully comprehend what I am learning" [like generating questions about it]"
Building a repertoire of strategies	[thinking about strategies discussed in seminar] "it was good to know why teachers do what they do"	"Using questioning techniques learned in seminar, allowed me to step aside for a moment and allow the students to be the teacher."

Findings: RQ3. Science identity as an outcome expectation

Theme	Lynda	Cheryl
Recognition as a "science person"	"I became interested in science when I was really young. I enjoyed building things with my uncle in his workshop."	[did well in science and math in high school.] "With parents' encouragement, I entered the Speed School of Engineering."
Recognition of self as a science teacher	"At first I never considered teaching because I did not believe I had the patience to be a UTA." [as a UTA, found she does have patience]	[was a summer nanny when I was in high school.] "I have always wanted to make a big impact on kids' lives."
Recognition by others as a science teacher	My whole family supports my plans to become a teacher. [sister-in-law is a teacher]	"My parents were initially disappointed when I wanted to teach science; they thought I could do so much more." "They have come to support my decision."

Conclusions

Characteristics of effective UTA programs

Open doors

- Visible support from STEM content faculty (program validity)

- Demonstrates validity of teaching as a profession (systematic, knowledge base, can be learned, …)

Take first steps together

- Builds in systematic opportunities to actively teach AND to regularly reflect on that teaching AND to share those reflections in a learning community

- Extends initial good science student identity into teaching science identity

Implications

- If teaching is seen as an honor and a valued activity worth a stipend, high performing undergraduate STEM students may be attracted to becoming a STEM UTA and opening a door that may lead to other opportunities.

- Without support from both education and STEM faculty for the first few steps, UTAs may stumble in the classroom, acquiring a negative impression of teaching.

- Collaboration between STEM faculty and education faculty may be essential to credibility of the program for students.

Questions