

## Introduction

### PROJECT GOAL

- Increase retention and graduation of undergrad STEM majors

### Secondary Goals

- Strengthen teaching skills of future STEM faculty
- Expand & strengthen the high school STEM teaching pool

### CORE PROJECT STRATEGY

- Preparing Peer Mentors: Credit-bearing Undergraduate Teaching Assistants (UTA) practicum courses that support up to 180 upper-level STEM majors in nine participating departments each academic year
- Supporting Undergraduate STEM learning: UTAs transform teaching and learning in introductory courses for STEM majors

## Research Questions

- 1) How were UTA teaching and peer mentoring skills impacted by their experiences?
- 2) How were UTA's self-learning (metacognitive learner, foundational content knowledge) impacted by their experiences?
- 3) How were undergraduates impacted by the UTAs?



## Methods

### UTA (n=44) PREPARATION AND SUPPORT:

- 3-day workshop pre-semester emphasizing *experiencing* and *distilling* best practice strategies such as formulating guiding questions, formative assessments, & promoting metacognitive learning.
- Semester-long seminar series (bimonthly)

### DATA SOURCES

- UTA post-survey (5-pt Likert scale) with 11 items (4=agree, 5=strongly)
- UTA final semester reflection (7 open-ended questions)

### DATA ANALYSES

- Factor analysis of 11 Likert items, followed by generation of emergent themes from the factors.
- *A priori* codes from literature for open-ended reflection questions
- Analytic inductive methods

## Emergent Findings

### SURVEY FACTOR ANALYSIS (n=44)

- One item was removed because it had low communality and the lowest loading factor (< .5) of all eleven items, resulting in 10 items remaining
- 10 Likert items reduced to three factors using principal components analysis with varimax rotation
- Scree plot tails off after 3 factors, which is consistent with the Kaiser Criterion because the first three factors have eigenvalues > 1
- Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) of .595 is considered low (but acceptable because it is greater than .5), reflecting the low *n* from this pilot study
- Proportion of variance explained by the three factors was 61%
- Factor loading of all items to factor > 0.6 with one exception (0.53)

### THREE EMERGENT FACTORS

- (1) Disciplinary Foundational Content Knowledge (4 items, 25% of variance)  
[confidence in content knowledge for addressing student questions]  
Mean = 4.35, Std. Dev = 0.72
- (2) Teaching Skills (4 items, 23% of variance)  
[improved UTA ability to help others understand concepts]  
Mean = 3.83, Std. Dev = 0.81
- (3) Professional Communication & Collaboration Skills for Peer Mentoring (2 items, 12% of variance)  
[strengthened communication skills]  
Mean = 4.20, Std. Dev = 0.72

## Emergent Findings (continued)

### OPEN-ENDED REFLECTIONS (n=42)

#### Impact on Undergraduates

- 30 of 42 indicated positive interactions with their students (encouraging efforts in class, concept clarification, study habits advice, class and career plan discussions)
- 15 indicated they helped students earn better grades

#### Peer Mentoring Skills

- Improved communication skills through being able to more clearly explain concepts in more than one way
- Improved ability to use specific pedagogical techniques
- Understanding student perspective is key to being effective

#### UTA self-learning

- Improved own 'learning how to learn' (26 out of 42)
- Review of foundational knowledge strengthened own knowledge base (16)
- 9 UTAs highlighted identification with the faculty experience

#### Recommendation and value of experience

- 100% of UTAs indicated they would recommend this to others
- Valuable for future teaching assignments (grad school, faculty)
- Strengthens own content knowledge foundations
- Took more time and effort than they expected (but was worth it)

## Implications

- Preliminary positive evidence of impact on undergraduates
- Positive impact on UTAs
  - Peer mentoring & teaching skills
  - Becoming better learners themselves
  - Disciplinary foundational content knowledge
  - Communication
- Potential for transforming STEM teaching & learning
- Potential long-range impacts from UTAs future career effectiveness, particularly careers which require strong communication skills

