Student Beliefs on Math Ability and Sense of Belonging to a Math Community

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Denison University
2015 MathFest Washington, D.C.

Overview

- Background

- Questions considered

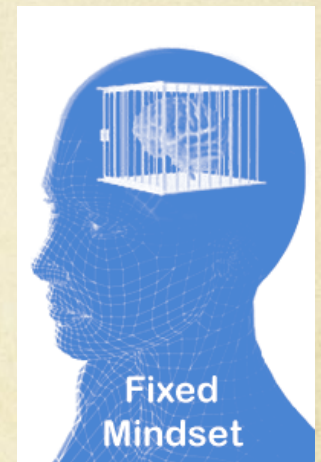- Survey instrument

- Results

- Future directions

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○ These two implicit theories have an impact on students' **motivation, effort, learning, and achievement** outcomes.

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Growth Mindset
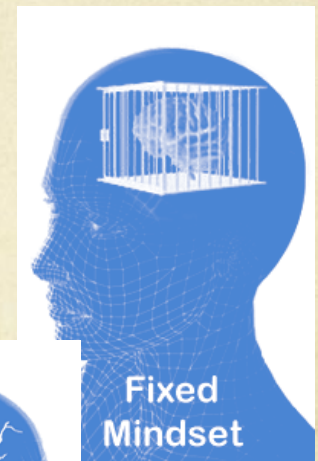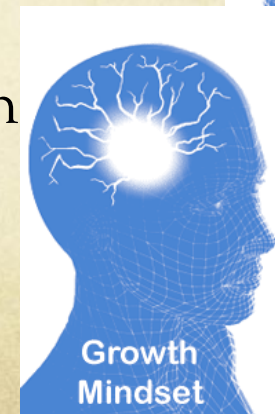
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○ Are there changes in students' implicit theories and sense of belongingness over the course of the semester?

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- Final grades processed by AAA and Faculty Fellow

Q1 fixed vs growth survey questions

- **Implicit theories** (5,10,14,20)
  - My math intelligence is something about me that I personally can't change very much.
  - To be honest, I don't think I can really change my math intelligence.
  - I don't think I personally can do much to increase my math intelligence.
  - I can learn new things, but I don't really have the ability to change my basic math intelligence.

Q2 Belongingness survey questions

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- **Trust** (4,18): When I am in a math setting,...
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Q2 Belongingness survey questions (cont.)

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- **Membership**: (2,7)
  - I feel that I belong to the math community

Other survey questions

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- **Future course** (21)
  - How likely are you to take math classes in the future?

The numbers

- Four 100-level courses (N=182):
  - Intro to stats – 44
  - Essentials of calculus – 41
  - Single variable calculus – 57
  - Multi-variable calculus - 40

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- Enjoyment – in general, I enjoy math.
- Future courses – How likely to take another math course?

Question 1

○ Do women and men students in lower-level mathematics courses differ in their **implicit theories** of math ability?

Question 1 results: Implicit theory

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- **End**: no significant change

- **Gender** *did not reveal any gender differences in implicit theory of math ability at either the beginning or end of the semester.* (approximately 115 women and 73 men)

Question 2

○ Do women and men students differ in their sense of **belongingness to a math community** and does **belongingness correlate with implicit theories** of math ability?

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- *men were less likely to report a motivation to fade from the math community* than women (2.2 vs. 2.58), but both numbers are good.

- There were *no significant gender differences in final course grade* (women = 2.81, men = 2.63) according to a paired-samples t-test.

Question 3

○ Are there **changes** in students' **implicit theories** and sense of **belongingness** over the course of the semester?

Question 3 results men: change in implicit theories & sense of belonging

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- *For men*, their implicit theory of their math ability *did not correlate* with any *belongingness* measure - membership, acceptance, positive affect, trust, or desire to fade.

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- or the remaining measures including *course grade.*

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○ *women* had significant (p<.05) *negative correlations* between their implicit theory of their math ability and *all* of the belongingness measures (but not for final course grade).

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- *women* had significant (p<.05) *negative correlations* between their implicit theory of their math ability and <u>all</u> *of the belongingness measures* (but not for final course grade).

- *women* who held a <u>stronger</u> incremental (malleable) theory of their math ability also reported *higher levels of membership, acceptance, positive affect, and trust as well as higher math self-concept, enjoyment, and motivation to take a future math course.*

Further work

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○ Collect more data – fall class of 2015

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- Collect more data – fall class of 2015

- Compare to senior math majors

THANKS!

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References

○ Dweck, C., & Legett, E. (1988). A social cognitive approach to motivation and personality. *Psychological Review, 95,* 256-273.

○ Good, C., Rattan, A., & Dweck, C. (2012). Why do women opt out? Sense of belonging and women's representation in mathematics. *Journal of Personality and Social Psychology, 102,* 700-717.

○ Rattan, A., Good, G., & Dweck, C. (2012). "It's ok- not everyone can be good at math": Instructors with an entity theory comfort (and demotivate) students. *Journal of Experimental Social Psychology, 48, 731-737.*
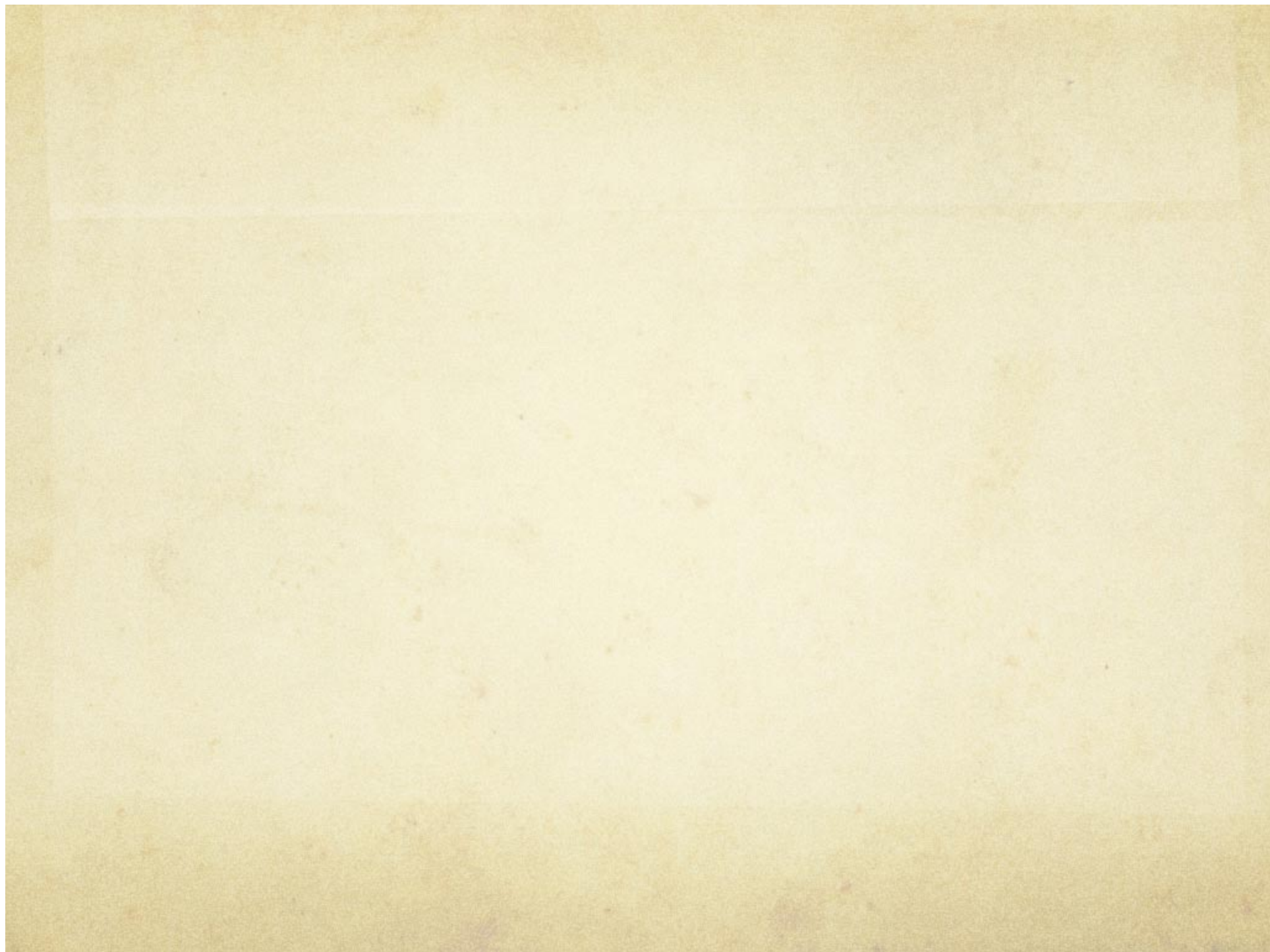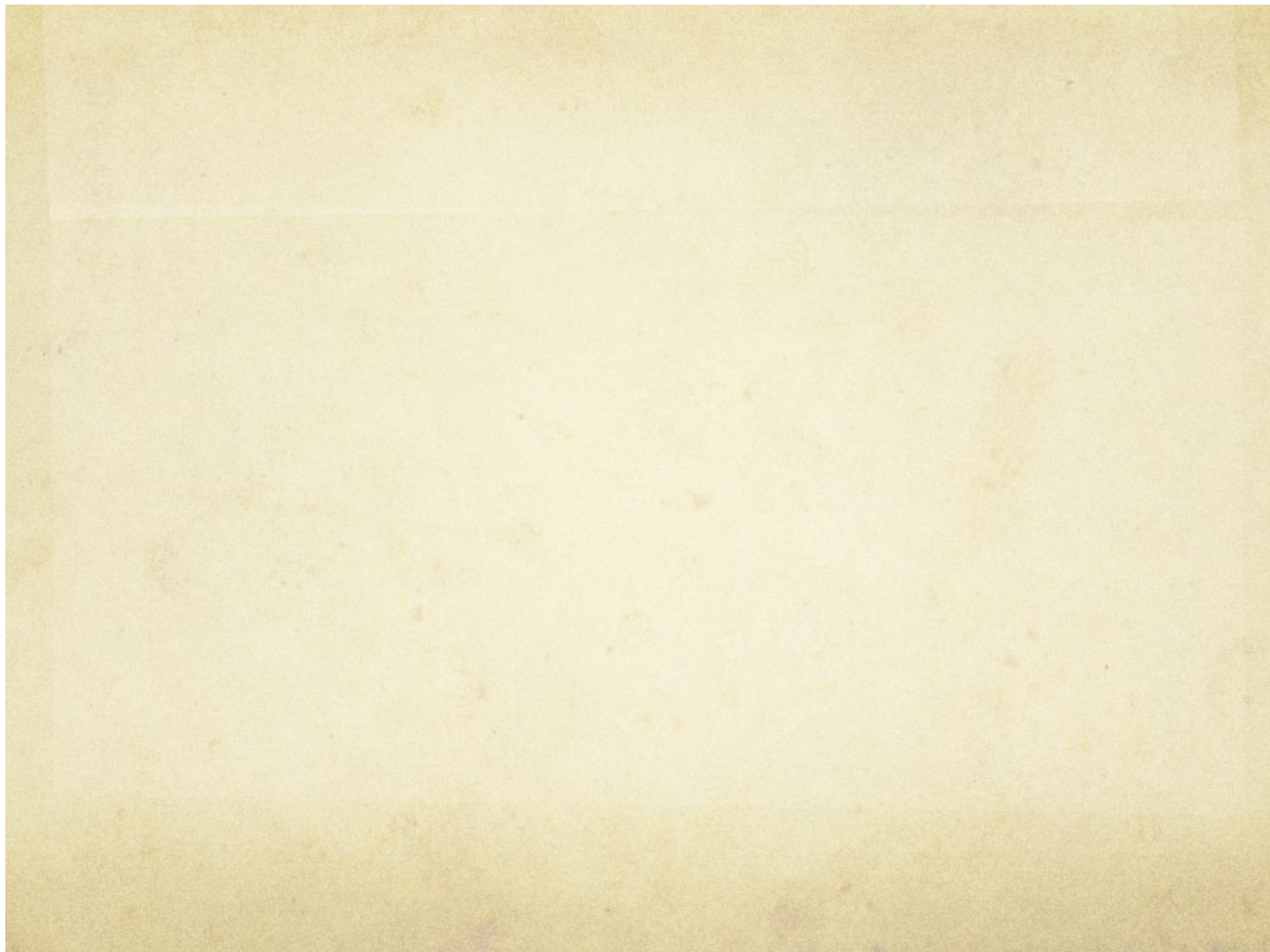
The survey

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- **Future course** (21) How likely are you to take math classes in the future?

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  - I have trust that I do not have to constantly prove myself.

- **Desire to fade**: (11,15) (When I am in a math setting, ...
  - I wish I were invisible.

- **Membership**: (2,7)
  - I feel that I belong to the math community.

Background

- Just in time targeted teaching

- Seven specific areas of algebra skills

- Intervention and control group

- Pre/Post Test

SOTL Take 1

○ Only two instructors – very different teaching styles

○ Small population size

○ Some students missed test

○ Found that intervention did not harm students (statistically significant?)

SOTL Take 2

1. A Beginner's Guide to the Scholarship of Teaching and Learning in Mathematics

Part A: Friday, August 8, 3:30 p.m. - 5:30 p.m., Hilton Portland Executive Tower, Salon Ballroom I
Part B: Saturday, August 9, 3:30 p.m. - 5:30 p.m., Hilton Portland Executive Tower, Salon Ballroom I

Jacqueline M. Dewar, *Loyola Marymount University*
Curtis D. Bennett, *Loyola Marymount University*

- Too ambitious

- Too many variables

- Hard to control

- Start simpler