The Increasingly Important Role of Science Competency Beliefs for Science Learning in Girls

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Women don’t choose STEM careers

... I'm only representing... all of womankind!!

DAAAAAH!!

Engineering: 1
Womankind: \emptyset

Ditz.

Psycho.

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Proportion of Women 2014

- Engineering: 20%
- Physical Sciences: 40%
- Biological Sciences: 60%
Elementary School:

Girls > Boys (Catsambis, 1995)
Middle School???

Girls > Boys (Catsambis, 1995)

Girls < Boys (Muller et al., 2001)

NOT Biological (Caplan et al., 1985; Spelke, 2005)
Middle School???

Girls > Boys (Catsambis, 1995)

Girls < Boys (Muller et al., 2001)

Motivation

LOW CONFIDENCE (OECD, 2015)
Why Would Competency Beliefs matter?

- Competency Beliefs
- Social Environment
- Behavior (Pajares, 2002)
- Learning Outcomes (Bandura 1986)
Why Would Competency Beliefs matter?

Competency Beliefs

Learning Outcomes (Bandura 1986)
Why Would Competency Beliefs matter?

Are Competency Beliefs more strongly associated with science content learning outcomes for girls than boys? (Bandura 1986)
Malleable Factors (ALES 2014)

<table>
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<th>2014-2015</th>
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<tr>
<td>6th + 8th grade</td>
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<tr>
<td>Fall</td>
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- **Fidelity / Activity Logs Activation**
  - Fall: Begin, Mid, End
  - Spring: ~3 times

- **Family Background**
  - Fall: Begin
  - Spring: ~3 times

- **Prior/Recent Experiences**
  - Fall: Begin
  - Spring: ~3 times

- **Content knowledge**
  - Fall: Pre
  - Spring: Post, ~3 times

- **Engagement**
  - Fall: ~3 times
  - Spring: ~3 times

- **Choice Preferences**
  - Fall: Begin
  - Spring: End

- **Career Interest**
  - Fall: Begin
  - Spring: End
Regression Analysis

Content Knowledge

Scientific Sensemaking

Learning Outcomes
Simultaneous Regression Analysis Std β

Content Knowledge
Scientific Sensemaking
Competency Beliefs
Grade
Sex

Learning Outcomes

Regression Coefficients:
- Content Knowledge: 0.36**
- Scientific Sensemaking: 0.35**
- Competency Beliefs: 0.08**
- Grade: 0.15
- Sex: 0.04
Simultaneous Regression Analysis Std β

- Content Knowledge
- Scientific Sensemaking
- Competency Beliefs
- Grade
- Sex

Learning Outcomes

- 0.36**
- 0.35**
- 0.30*
6th Grade

CB X Sex $\beta=-0.041$, $p=0.77$

Controlling for: Prior Content Knowledge & Scientific Sensemaking
8th Grade

CB X Sex $\beta=0.29$, $p=0.03$

Controlling for: Prior Content Knowledge & Scientific Sensemaking
Mechanism?

Competency Beliefs → Learning Outcomes
Mechanism?

Competency Beliefs → ? → Learning Outcomes
Is Choice Preferences a mediator?

Competency Beliefs → Choice Preferences → Learning Outcomes
Is Choice Preferences a mediator?

Competency Beliefs → Choice Preferences

Choice Preferences → Learning Outcomes

Competency Beliefs

Learning Outcomes

Is Choice Preferences a mediator?
Is Choice Preferences a mediator?

Competency Beliefs

Choice Preferences

Learning Outcomes
Is Choice Preferences a mediator?

Competency Beliefs

Learning Outcomes

Choice Preferences
What does this mean?

“It is not about how badly you want it.”
- Only true for boys

Choice Preferences of Optional Science Experiences
Conclusions

We extend on prior motivational work aiming to explain gender differences on science achievement

• **Access is not enough.** For girls

• **Focus on the development of competency beliefs**

• **Is about looking accessible too**
THANK YOU!!!

“We cannot succeed when half of us are held back.”
Malala Yousafzai
Malala Fund #IWD2014