Measuring Mentorship: Issues and Considerations

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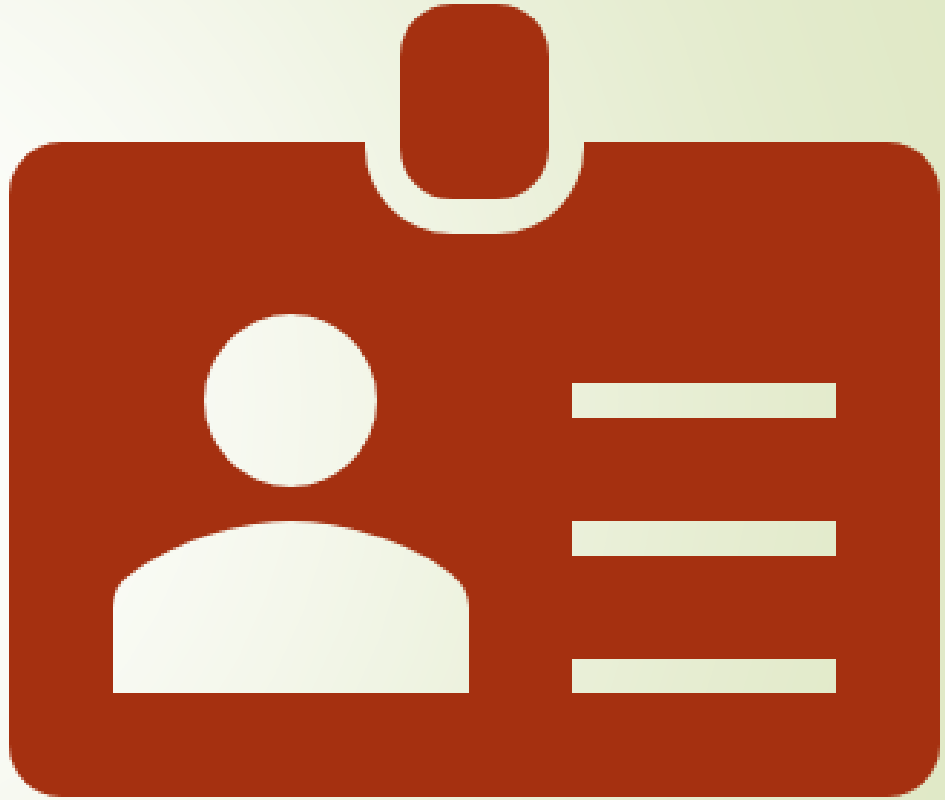
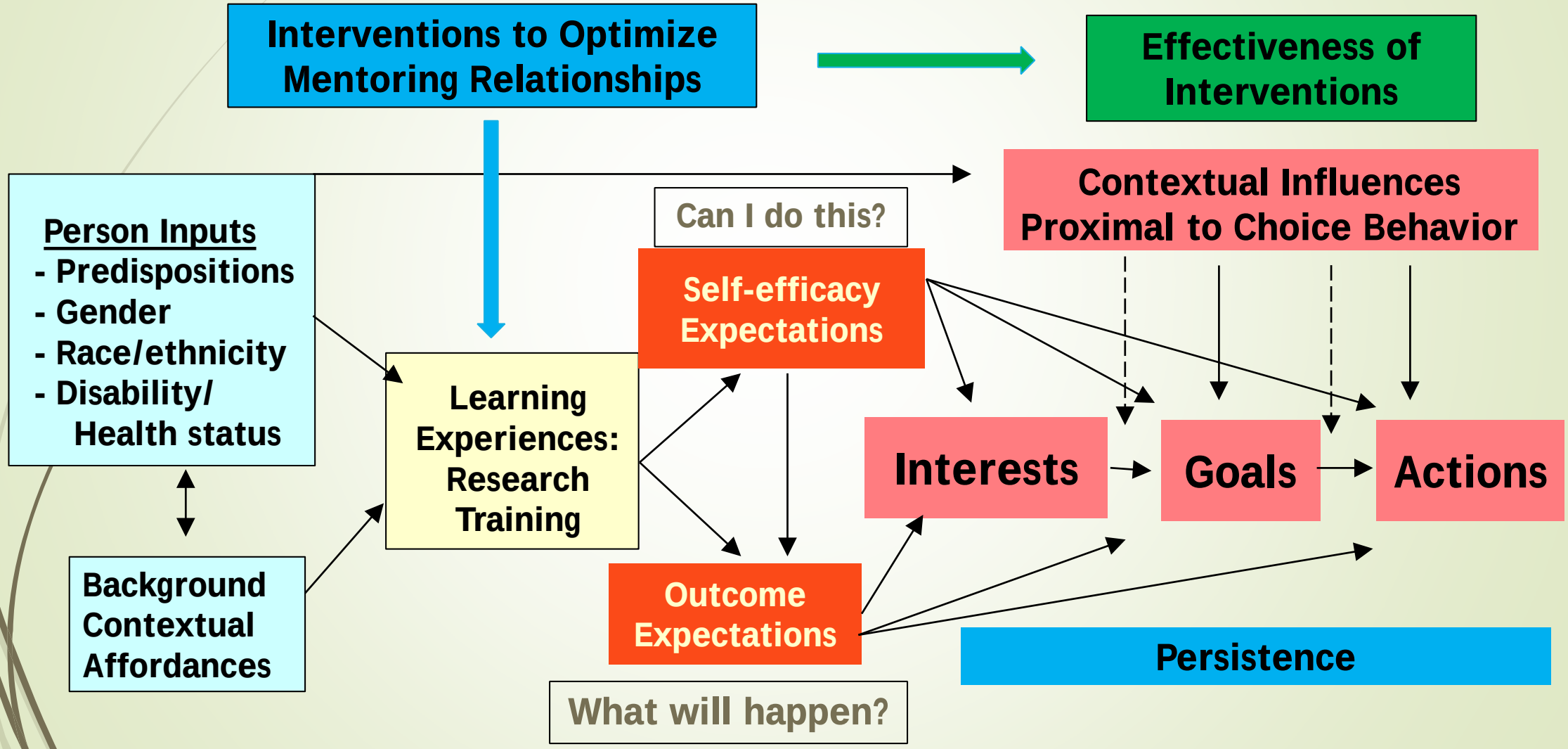
Good (useful) theories:

- **Explain**: provide understanding of how relationships among variables are organized for existing behavior or phenomena
- **Predict**: allows for testability of hypotheses against experiences (anticipated outcomes)
- **Control**: direct how and where to intervene on behavior/phenomena



Theoretical Framework to Study Mentoring: Social Cognitive Career Theory (Lent, Brown & Hackett, 1994, 2000)



A Primary Challenge in the Metrics of Mentorship

- How can the characteristics of effective mentoring programs and mentoring relationships in STEMM be assessed?

Three Issues:

1. How can we quantify “quality mentoring relationships?”

2. What metrics exist or can be adapted/developed to assess effective mentoring relationships in STEMM fields?

3. By what mechanisms can we effectively measure the most successful characteristics of mentoring relationships and programs?

Issue #1.
Quantifying “Quality” Mentoring Relationships

- What does existing evidence suggest are indicators that constitute “quality” in mentoring relationships?

- How well are these indicators being measured? Do these indicators hold across career stages? Across STEMM disciplines? Across demographic groups?

Issue #1. Continued

- Measuring perceived “quality” from both sides of the relationship for dyads
  - Parallel measures from mentors and trainees/protégés
- Measuring across multiple mentors and multiple relationships for a single mentee (mentoring networks)
- Measuring “quality” based on focus/goal of mentoring relationship

Issue #2:
Metrics to assess effective STEMM mentoring relationships

- What are the targeted domains to be assessed?
- What scales have been validated and for what populations, domains?
- How do scores on measures relate to actual mentorship behaviors?
- How can we create a comprehensive library of scales for discussion and use?

- Pfund and colleagues (2016, 2017) described 5 domains of mentorship that hold promise for organizing measurement development in this area:

*Research Skills

*Interpersonal Skills

*Diversity/Culturally-focused Skills

* Psychosocial Skills

* Sponsorship Skills

Metrics for Assessing Knowledge, Skills, and Effectiveness of Relationships

Demographics

Race
Ethnicity
Gender
Career Stage

Context/ Background

Previous Research Experience
Credit tor Doing Research

Social Cognitive Career Theory

Outcome Expectations
Research Self-Efficacy
Career Self-Efficacy
Sources of Self-Efficacy

Cultural Diversity Awareness

Attitudes
Behavior
Confidence
Identity

Quality of Mentoring

Mentor Effectiveness
Research Experience (Relationship Quality)
Quality of Mentoring

Research Experience/ Science Identity

Attitudes and Behaviors as a Researcher
Research Experience (activities)
Science Identity/
Thinking and Working Like a Scientist

Mentee Confidence/ Skill Gains

Research Self-Efficacy
Personal Gains Related to Research Work
Gains in Skills

Mentor Confidence/ Skill Gains

Mentor Competency Assessment
Mentoring Self-Efficacy

Intent/ Plans for Future

Career Plans
Research Experience (Impact)
Research Experience (Intentions)

Behavioral Changes

Mentee career decisions/ progression
Mentee productivity
Mentor actions

Evaluation of Mentor Training

Satisfaction
Targeted Knowledge/ Skill Gains
Changes in Practice

Evaluation of Mentee Training

Satisfaction
Targeted Knowledge/ Skill Gains
Changes in Practice

Evaluation of Culturally Aware Mentorship Training

Satisfaction
Targeted Knowledge/ Skill Gains
Changes in Practice

Evaluation of Other Training (e.g Career Coaching

Satisfaction
Targeted Knowledge/ Skill gains
Change in Practice

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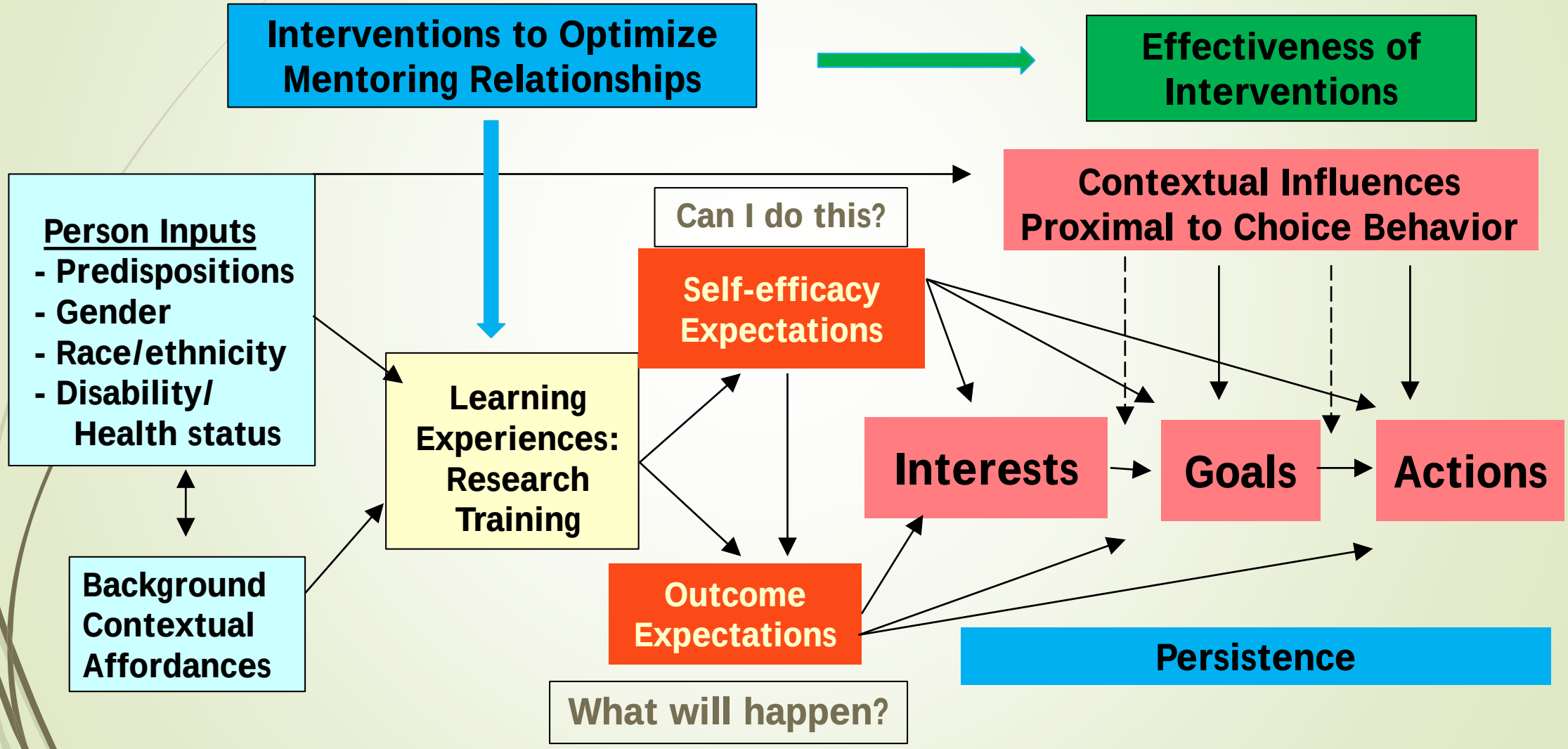

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Building on Kelman's social influence theory....

Who integrates into the scientific community?

Tripartite Integration Model of Social Influence (TIMSI)

Scientific self-efficacy	• I can do what scientists do
Scientific identity	• I am a scientist
Internalization of scientific values	• I agree with the values of the scientific community

+ Integration (persistence)

+

+

Estrada et al., 2011

Issue #3: Mechanisms to measure successful mentoring relationships/programs?

- What indicators can be used to measure “success” of mentoring?
- What percent of mentoring programs in STEMM that have been published, have been evaluated with measures beyond satisfaction, participation rating items? What percent of those have used measures reporting psychometric information (i.e., validity, reliability)?
- Of 60 empirical studies, ½ relied on self-reported data via surveys or interviews, < 10% validated self-report data with direct measures of longitudinal persistence, research productivity, or direct observation of skills (Linn et al., 2015)
- In 20 empirical studies of mentoring programs, not one included experimental design (Gershenfeld , 2014)

What Is Needed?

- Metrics that are:
  - Theoretically-grounded (e.g., allows for hypothesis-testing)
  - Psychometrically-sound (e.g., factor analyzed, internally reliable)
  - Culturally valid across various demographic groups
  - Informative of actual/future behavior (e.g., diagnostic, evaluative information)

What Are Some Next Steps?

References

- Gershenfeld, S. (2014). A review of undergraduate mentoring programs. Rev. Educ. Res. 84, 365–391.
- Linn, M.C., Palmer, E., Baranger, A., Gerard, E., and Stone, E. (2015). Undergraduate research experiences: Impacts and opportunities. Science 347, 1261757.
- Pfund, C. (2017). Studying the role and impact of mentoring on undergraduate research experiences. Commissioned paper for the Undergraduate Research Experiences Committee. National Academies of Science
- Pfund, C., Byars-Winston, A., Branchaw, J.L., Hurta.do, S., and Eagan, M.K. (2016). Defining Attributes and Metrics of Effective Research Mentoring Relationships. AIDS and Behav.