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)

Interventions to Optimize Mentoring Relationships

Effectiveness of Interventions

Contextual Influences Proximal to Choice Behavior

Person Inputs
- Predispositions
- Gender
- Race/ethnicity
- Disability/Health status

Background Contextual Affordances

Learning Experiences: Research Training

Can I do this?

Self-efficacy Expectations

Outcome Expectations

Interests → Goals → Actions

Persistence

What will happen?
A Primary Challenge in the Metrics of Mentorship

- How can the characteristics of effective mentoring programs and mentoring relationships in STEM 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 STEM 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 STEM 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
<table>
<thead>
<tr>
<th>Demographics</th>
<th>Research Experience/ Science Identity</th>
<th>Evaluation of Mentor Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race</td>
<td>Attitudes and Behaviors as a Researcher</td>
<td>Satisfaction</td>
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<tr>
<td>Ethnicity</td>
<td>Research Experience (activities)</td>
<td>Targeted Knowledge/ Skill Gains</td>
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<td>Gender</td>
<td>Science Identity/</td>
<td>Changes in Practice</td>
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<tr>
<td>Career Stage</td>
<td>Thinking and Working Like a Scientist</td>
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<tr>
<th>Context/ Background</th>
<th>Social Cognitive Career Theory</th>
<th>Evaluation of Mentee Training</th>
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<tbody>
<tr>
<td>Previous Research Experience</td>
<td>Outcome Expectations</td>
<td>Satisfaction</td>
</tr>
<tr>
<td>Credit for Doing Research</td>
<td>Research Self-Efficacy</td>
<td>Targeted Knowledge/ Skill Gains</td>
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<td>Career Self-Efficacy</td>
<td>Changes in Practice</td>
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<td></td>
<td>Sources of Self-Efficacy</td>
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<th>Cultural Diversity Awareness</th>
<th>Mentee Confidence/ Skill Gains</th>
<th>Evaluation of Culturally Aware Mentorship Training</th>
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<tr>
<td>Attitudes</td>
<td>Research Self-Efficacy</td>
<td>Satisfaction</td>
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<tr>
<td>Behavior</td>
<td>Personal Gains Related to Research Work</td>
<td>Targeted Knowledge/ Skill Gains</td>
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<td>Confidence</td>
<td>Gains in Skills</td>
<td>Changes in Practice</td>
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<th>Evaluation of Other Training (e.g Career Coaching)</th>
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<tr>
<td>Mentor Effectiveness</td>
<td>Mentor Competency Assessment</td>
<td>Satisfaction</td>
</tr>
<tr>
<td>Research Experience</td>
<td>Mentoring Self-Efficacy</td>
<td>Targeted Knowledge/ Skill gains</td>
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<tr>
<td>(Relationship Quality)</td>
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<td>Change in Practice</td>
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<td>Quality of Mentoring</td>
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<th>Intent/ Plans for Future</th>
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<td>Mentee productivity</td>
<td>Research Experience (Impact)</td>
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<tr>
<td>Mentor actions</td>
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- Gender
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What will happen?
### Demographics
- Race
- Ethnicity
- Gender
- Career Stage

### Context/ Background
- Previous Research Experience
- Credit for 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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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 STEM 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