Mentoring: Science or Art?

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Co-PI, National Research Mentoring Network (NRMN)
Wisconsin Center for Education Research
Institute for Clinical and Translational Research
University of Wisconsin-Madison
Topics

- Mentoring: Definition and Experience
- The Science of Mentorship
- National Focus on Mentorship and Calls to Action
- Answering the Calls: Improving Your Own Mentoring
- The Art of Mentoring: An Idea
Mentoring: Definition and Experience
Defining Mentoring

A collaborative learning relationship that proceeds through purposeful stages over time and has the primary goal of helping mentees acquire the essential competencies needed for success in their chosen career.

It includes using one’s own experience to guide another through an experience that requires personal and intellectual growth and development.

Roles Mentors are Playing

An Example:

**Advising:** "I think it's a good idea for you to go to this conference."

**Supervising:** "I need you to go to this conference to represent the lab."

**Mentoring:** "What do you think are the benefits and drawback of going to the conference? What do you think is best for you? [the mentor listens and asks follow-up questions]

**Sponsorship:** "If you go to this conference, I can arrange for you to meet a buddy of mine, who has been looking for someone with your skills for a collaboration."

Adapted from Terry McGlynn, Small Pond Science
MT-DIRC Fellows: Mentoring Experience and Activities

• Mentoring in the past

• Mentoring now

• Mentoring in the near future

• Beyond your own mentoring (programs, training grants, professional societies, etc)
The Science of Mentorship

Subjecting Mentoring to Scientific Inquiry

Mentoring
A Mentored Research Experience and Strong Mentorship has been linked to:


- **Persistence** (Gloria *et al*, 2001; Solorzano 1993; McGee and Keller, 2007; Sambunjak *et al*, 2010; Williams *et al*, 2015; Bordes-Edgar et al., 2011; Campbell and Campbell, 1997)

- **Research productivity** (Steiner and Lanphear, 2002; 2007; Wingard *et al*, 2004)

- **Higher career satisfaction** (Schapira *et al*, 1992; Beech *et al*, 2013)

Context: Uneven Landscape of Mentoring

- White investigators significantly more likely than Black and Hispanic investigators to win R01 awards; minority investigators indicate that inadequate mentoring posed obstacles to obtaining funding (Ginther et al., 2011)

- Science faculty rated male applicant as more competent than identical female applicant; offered male ~ $4,000 more in salary, more career mentoring than to the female (Moss-Racussin et al., 2012)

- URMs and White women’s mentorship requests more ignored than those by White men (Milkman et al., 2014)

- Male biologists less likely to hire and train women in their laboratories (Sheltzer & Smith, 2014).

- URMs typically receive less mentoring than their non-minority peers (Thomas et al., 2001; Helm et al., 2000; Morzinski et al., 2002).
Scientific Study of Research Mentoring:

A Deeper Investigation of What Matters in Mentoring Relationships and the Factors that Impact Persistence
Theoretical Framework to Study Mentoring: Social Cognitive Career Theory
(Lent, Brown & Hackett, 1994, 2000)

What Roles Do Mentors Play that Impact Persistence?

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

Learning Experiences: Research Training

Background Contextual Affordances

Can I do this?

Self-efficacy Expectations

Interests

Goals

Actions

Contextual Influences Proximal to Choice Behavior

Outcome Expectations

Persistence

What will happen?
## Attributes for Effective Research Mentoring Relationships

<table>
<thead>
<tr>
<th>RESEARCH SKILLS</th>
<th>DIVERSITY/CULTURALLY-FOCUSED SKILLS</th>
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<tbody>
<tr>
<td>· Developing disciplinary research skills</td>
<td>· Advancing equity and inclusion</td>
</tr>
<tr>
<td>· Teaching and Learning disciplinary knowledge</td>
<td>· Being culturally responsive</td>
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<tr>
<td>· Developing technical skills</td>
<td>· Reducing the impact of bias</td>
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<tr>
<td>· Accurately assessing mentees’ understanding of disciplinary knowledge and skills</td>
<td>· Reducing the impact of stereotype threat</td>
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<tr>
<td>· Valuing and practicing ethical behavior and responsible conduct of research</td>
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<thead>
<tr>
<th>INTERPERSONAL SKILLS</th>
<th>SPONSORSHIP SKILLS</th>
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<tbody>
<tr>
<td>· Listening actively</td>
<td>· Fostering mentees’ independence</td>
</tr>
<tr>
<td>· Aligning mentor and mentee expectations</td>
<td>· Promoting professional development</td>
</tr>
<tr>
<td>· Building trusting relationships/ honesty</td>
<td>· Establishing and fostering mentee professional networks</td>
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<td></td>
<td>· Actively advocating on behalf of mentees</td>
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<table>
<thead>
<tr>
<th>PSYCHOSOCIAL SKILLS</th>
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<tr>
<td>· Providing motivation</td>
<td></td>
</tr>
<tr>
<td>· Developing mentee career self-efficacy</td>
<td></td>
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<tr>
<td>· Developing mentee research self-efficacy</td>
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<tr>
<td>· Developing science identity</td>
<td></td>
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<tr>
<td>· Developing a sense of belonging</td>
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Characteristics of Successful and Failed Mentoring Relationships: A Qualitative Study Across Two Academic Health Centers

Sharon E. Straus, MD, Mallory O. Johnson, PhD, Christine Marquez, and Mitchell D. Feldman, MD

Abstract

Purpose
To explore the mentor–mentee relationship with a focus on determining the characteristics of effective mentors and mentees and understanding the factors influencing successful and failed mentoring relationships.

Method
The authors completed a qualitative study through the Departments of Medicine at the University of Toronto Faculty of Medicine and the University of California, San Francisco, using transcripts of the interviews, drawing on grounded theory.

Results
The authors completed interviews with 54 faculty members and identified a number of themes, including the characteristics of effective mentors and mentees, actions of effective mentors, characteristics of successful and failed mentoring relationships, and tactics for successful mentoring relationships. Successful mentoring personality differences, perceived (or real) competition, conflicts of interest, and the mentor’s lack of experience.

Conclusions
Successful mentorship is vital to career success and satisfaction for both mentors and mentees. Yet challenges continue to inhibit faculty members from receiving effective mentorship. Given the importance of mentorship on faculty members’ careers, future studies must address the association between a failed mentoring relationship.

- Reciprocity
- Clear Expectations
- Mutual Respect
- Personal Connection
- Shared Values
Theoretical Framework to Study Mentoring: Social Cognitive Career Theory
(Lent, Brown & Hackett, 1994, 2000)
A mentor training curriculum was developed and tested

Key elements of mentor training:

• Process-based using case studies and group problem solving

• Aimed at awareness-raising and reflection

• Provides a confidential and brave forum to share the collective experience of mentors across a range of experiences

• Distribute and adapt resources to improve mentoring
... with standardized competencies...

- Aligning expectations
- Promoting professional development
- Maintaining effective communication
- Addressing equity and inclusion
- Assessing understanding
- Fostering independence
- Cultivating ethical behavior
- And more in development!
...and published evidence regarding its effectiveness


Theoretical Framework to Study Mentoring: Social Cognitive Career Theory
(Lent, Brown & Hackett, 1994, 2000)
Mentor Effectiveness Associated with Mentee Research Skill Assessment and Confidence

Results of Path Model Tested

Students’ perceptions of Mentors’ Effectiveness positively associated with positive evaluation of their own Research Skills/Career Knowledge

Research Skills/Career Knowledge positively associated with Research Self-Efficacy

PhD/MD enrollment

“My mentor showed interest in my research project”
“My mentor appreciated my contributions”
“My mentor made me feel included in the lab”

National Focus on Mentorship and Calls to Action
A National Focus on Mentoring

- **National Science Foundation (NSF)**
  - Post-doctoral mentoring plans
  - Undergraduate research AND mentoring programs
  - AAAS/ PASEMEN STEM Mentoring 2030 Meeting

- **Sloan Foundation**
  - University Centers for Exemplary Mentoring

- **Howard Hughes Medical Institute**
  - Mentor and mentee training program for Gilliam Scholar Programs

- **National Academies of Science**
  - New Report on Mentored Undergraduate Research Experiences
  - *The Science of Effective Mentoring in STEMM*
  - Graduate STEM Education for the 21st Century

- **National Institutes of Health (NIH)**
  - Mentored K awards
  - Individual development plans (IDPs)
  - NIGMS T32 Requirement
  - National Research Mentoring Network (NRMN)
THE SCIENCE OF EFFECTIVE MENTORING IN STEMM

Science, technology, engineering, mathematics, and medicine (STEMM) are reflections of the people who participate in the endeavor. Strong mentors are critical in the development of undergraduate and graduate students in STEMM—especially for many members of historically underrepresented populations. With the broader goal of ensuring that mentors and mentees are educated and trained with the evidence-based knowledge and skills necessary to ensure highly productive and sustainable mentoring relationships the Committee will...

• Study STEMM mentoring programs and practices at the undergraduate and graduate levels
• Focus on identifying evidence (or lack thereof) regarding successful programs for mentoring of individuals traditionally marginalized in STEMM fields, including women, individuals from racial/ethnic groups historically underrepresented in STEMM, and first-generation college students
• Answer questions, such as:
  • What are common definitions and differentiations among the various models of mentoring in STEMM?
  • What are the most successful elements of effective mentoring relationships in STEMM education at the various stages of career development?
  • How can and should mentees and mentors be trained to be more effective in the mentor-mentee relationship?
• Issue a final report and create an online interactive guide of effective programs and practices that can be adopted and adapted by institutions, departments, and individual faculty members
THE SCIENCE OF EFFECTIVE MENTORING IN STEMM

Angela Byars-Winston (Chair)
University of Wisconsin–Madison

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University of South Florida

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University of North Carolina Wilmington

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University of California, Los Angeles

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CONTACT
For more information, please visit www.nas.edu/mentoring or email mentoring@nas.edu
A National Focus on Mentoring

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"As currently structured, funding criteria for training grants or for supporting graduate assistants on research grants typically emphasize traditional measures of research productivity and the numbers of academic researchers being produced, but place much less emphasis on the quality of teaching and mentorship that students receive. Those criteria need to be rebalanced to give more weight to quality educational experiences that will benefit students no matter their career aspirations."
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New NIGMS T32 FOA (PAR-17-341)

Program Oversight, Program Faculty Selection, and Mentor Training

The application should describe how the program faculty are trained to ensure the use of evidence-based teaching, training and mentoring practices that promote the development of trainees from all backgrounds, with particular attention to trainees from underrepresented backgrounds in the biomedical sciences.
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National Research Mentoring Network (NRMN)

Provides biomedical research trainees with evidence-based mentorship and professional development programming that emphasizes the benefits of diversity, inclusivity and culture within mentoring relationships.
Answering the Calls: Improving Your Own Mentoring

Resources
Resource #1: What does NRMN offer its members?

- **Virtual guided mentorship** in your field that directly addresses diversity, inclusivity and culture.
- **Virtual and in-person training programs** such as mentorship training for mentors and mentees, training workshops for mentorship program facilitators, and career coaching.
- **Grantwriting coaching** to develop a competitive grant proposal for a research project and/or research career development award in any biomedical or bio-behavioral discipline.
- **Professional and career development webinars, videos, news and links.**
- Information about **nationwide diversity efforts** and **grant funding opportunities**.
- Opportunities to establish a **network of professional support**.
NRMN serves as a national training hub to improve mentoring relationships

Activities:

• Face-to-face mentor training workshops
• Face-to-face mentee training workshops
• Self-paced online training
• Synchronous online training
• Train-the-trainer workshops
• New modules
Resource #2: “Optimizing the Practice of Mentoring”
Online self-study for mentors of grad students, postdocs, and faculty

http://z.umn.edu/OptimizingMentoring
Resource #3: Materials for the mentors of grad students, postdocs, and junior faculty

mentoringresources.ictr.wisc.edu
Resource #4: Mentoring Compacts Online (Tools for your varied mentoring relationships)

https://ictr.wisc.edu/mentoring/mentoring-compactscontracts-examples/

MENTORING COMPACTS/CONTRACTS EXAMPLES

Below are five different frameworks to help each mentor customize your own compact. See which elements appeal to you and the needs of your mentees, and use them to launch a thorough and explicit conversation early on in the project and/or relationship. Use the documents dynamically to structure regular conversations and help ensure follow-thru.

1. Pre-determined list: Compact Between Postdoctoral Appointees and Their Mentors (PDF)
2. Team-based: Team Mentoring Contract (PDF)
3. Individual lab:
   a. Sample Compact from McMahon Lab (PDF)
   b. Ramsay Guide for Research Students (PDF)
4. Question-based: UAB Mentor Contract (PDF)
5. General purpose: Mentorship Agreement Template (PDF)
Resource #5: CIMERProject.org

CIMER: Providing resources for organizations and institutions to improve mentoring relationships

Effective mentoring relationships are critical to developing the next generation of researchers. Learn how to improve these relationships and promote a cultural change that values mentoring as a critical aspect of diversifying the scientific workforce.

Who are we?

Researchers and practitioners dedicated to improving the mentoring relationships among all levels of post-secondary researchers through theoretically grounded, evidence-based, and culturally driven training interventions and investigations.

What do we do?

CIMER faculty and staff investigate approaches for advancing research mentoring relationships, and develop, implement and evaluate mentor and mentee training towards this end.

CIMER

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SUBSCRIBE TO OUR LISTSERV

Email

UW and WCER logos coming soon.

PARTNERS
CIMER Curricula
The Art of Mentoring: An Idea
Mentoring relationships are the incubating space in which emerging scientists are developed and the future scientific workforce is forged.

The research mentoring relationship (and the educational training experience) is the primary mechanism for growing the next generation of scientists.

And mentoring occurs in context
The Context (Canvas) for the Mentoring Relationship

Institution

Lab

Department

Training Program
Acknowledgements

Many, many partners and collaborators

You!
Research Mentor Training Funding

- Original *Entering Mentoring* curriculum (HHMI Professors Program, PI: Handelsman)
- Adapted for use across science, technology, engineering, math, and social sciences (NSF #0717731, PI: Pfund) and clinical and translational science (CTSA) award mentors (NIH/NCRR ARRA UL1RR025011, PI: Drezner)
- Workshops and curricula have been developed for faculty mentors (NSF #0717731, PI: Pfund) including training workshops for T32 and R25 trainer
- NIH has funded a study to develop better understanding of specific factors in mentoring relationships that account for positive student outcomes (NIH #1R01GM094573-0 PI: Byars-Winston, co-I: Pfund) and renewal to focus on cultural aspects of mentoring relationships (PIs: Byars-Winston and Pfund)
- The curriculum has been adapted for use in a synchronous, online venue through the NSF-funded Center for the Integration of Research, Teaching and Learning (CIRTL) Network (NSF DUE-0717768, PI: Mathieu)
- CIRTL and APS partnered to adapt the curriculum for physic mentors.
- NIH has funded legacy website (3UL1RR025011-05S1, PI: Drezner), randomized controlled trial (3UL1RR025011-03S1, PI: Drezner) and train-the-trainer workshops (R13GM106445, Co-PIs: Pfund and Sorkness)
- *Optimizing the Practice of Mentoring* online module developed at the University of Minnesota’s NIH-funded Clinical and Translational Science Institute (UL1TR000114)
- NIH has funded National Research Mentoring Network (NRMN) (U54 MD0009479-01)