Strategies for Inclusive Mentorship in Computing

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Today, We Will Discuss…

• How diversity, equity, and inclusion (DEI) shape effective software development practice
• The value of mentorship in building and sustaining a capable HPC workforce
• How a DEI lens can aid our understanding of best practices in mentorship
• How we can put this information to good use!
Diversity, Equity, and Inclusion in Software Development Practice
My Perspective as a Software Engineering Researcher

• As a researcher, I am interested in…
  – Understanding how people work together to create software
  – Finding better tools and processes that can empower those people

• I want to advance standards of evidence-based practice in the development of computational science and engineering software.
And By Evidence, I Mean...

- Systematic Reviews and Meta-Analyses
- Primary Studies
- Gray Literature
- Our Experiences and Our Values

- The foundation of all decision-making is our experiences as practitioners and our values.
- Incorporating high-quality evidence helps reduce bias and mitigate risk, enabling better decision-making.
To Code is Human

- Software development is a fundamentally human activity
- Our values and experiences are key to achieving excellence in practice
- As someone who is LGBTIQ+ and on the autism spectrum, I want to help create cultures that are inclusive of everyone
Evidence: DEI Matters in Software Development

• Gender diversity is correlated with increased productivity and reduced turnover and conflict in software teams [Vasilescu et al.]

• Software teams having diverse educational backgrounds tend to rank higher in team efficiency [Altiner and Ayhan].

• Among diverse, geographically distributed teams, teams with lower perceived distance tend to be more collaborative and coordinated [Robert].


Remote work offers a *mechanism of control* for *identity disclosure and empowerment* of software developers from marginalized communities, such as transgender software developers [Ford et al.].

For visually-impaired UI/UX developers, having descriptive comments and meaningful variable names makes it easier to *develop mental models* of code and to *collaborate more effectively* [Pandey et al.].

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Mentorship in an HPC Workforce Development Context
Defining Mentorship

By mentorship, we mean a relationship in which a more experienced or more knowledgeable person (a mentor) helps to guide a less experienced or less knowledgeable person (a mentee).
In mentorship, we aren’t just learning a *mechanical set of skills*, we learn what it means to *be something*. We pick up all kinds of *norms* and *narratives* and *ways of seeing the world* that shape our identity as professionals.

Mentorship in a DEI Context

- Mentorship can support the growth and retention of professionals from underrepresented and marginalized groups by *bringing them into the fold* and *empowering* them.
- From a research perspective, a DEI lens on mentorship can also assist in developing a *comprehensive view on the practice*
  - Underrepresented and marginalized groups often face similar challenges as their peers but feel the effects of those challenges at a larger scale.
Why Mentorship? Why Now?

- The HPC workforce is continuing to diversify, as exemplified by the research software engineering (RSE) movement
  - RSE departments at universities and national labs
  - National, non-profit RSE organizations
  - RSE conferences, workshops, and other colloquia
- We must promote the ongoing skill development and career advancement of those professionals
Why Mentorship? Why Now?

- Looking beyond Exascale computing, we anticipate many more disruptive cycles of innovation in computing technologies. RSEs will need to keep growing and learning.
- This is also a retention challenge. We must sustain a vibrant community of practice capable of meeting present and future needs.
Common Themes We’ve Found In Mentorship of Software Developers (1/2)

- Among developers we’ve interviewed and surveyed…
  - Ideal mentors are **honest, active listeners, trustworthy, and accessible** to their mentees
  - Ideal outcomes of mentorship include **encouraging skill development, promoting self-awareness, coaching and vision-building**, and **navigating the institution**.
Common Themes We’ve Found In Mentorship of Software Developers (2/2)

- A **lack of time** to provide mentorship is the number #1 barrier.
- Institutions must **allocate resources** for mentorship activities.
Mentorship Through a DEI Lens
Work Remains to Be Done on Inclusion in STEM

LGBTQ STEM professionals are more likely to experience career limitations, harassment, and professional devaluation than their non-LGBTQ peers\cite{Cech}.

Women in STEM tend have lower social capital (e.g., support networks) and may also perceive their academic climate as unwelcoming and threatening\cite{Casad}.

Discrimination and harassment are documented causes of underrepresentation of BIPOC in STEM\cite{Chaudhary}.

Getting at the Heart of Mentorship Practice

• As we mentioned earlier, studying software practices through the lens of DEI can **enrich our understanding** of those practices.

• Along these lines, we can study mentorship to surface useful **strategies that promote inclusion**.
Mentorship of Women in OSS Projects: A Cross-Disciplinary, Integrative Review

- We investigated the *challenges* women mentees face in open-source software (OSS) and possible *strategies* that may help overcome those challenges.

- Double literature mapping study:
  - Mentorship of women in OSS contexts
  - Mentorship of women in the broader workforce outside software engineering (such as nursing, K-12 education, policing, etc.)

Reported Barriers to Women Receiving Mentorship (Of Which There Are Many)

RQ1. What are the current challenges that women mentees face in receiving mentorship in professional/OSS contexts?

- Personal Barriers
  - Women Are Seen (And/or See Themselves) As Less Capable
  - Women Have to Adapt to Male Standards of Behavior
  - Women Are Seen As Having Competing Priorities in the Home

- Relational Barriers
  - Inappropriate Behavior from Mentors and/or Perceptions of Impropriety
  - Mentors Reluctant to Mentor Women and Minorities
  - Women Less Likely to Be Included and Less Likely to Receive Mentorship

- Organizational Barriers
  - Lack of Women in Top Positions
  - Male-Gendered Workplaces Disadvantage Women in Mentorship
  - Formal Mentorship Has Mixed Results for Women and Minorities
Recommended Mentorship Practices (1/2)

• Matching women with women mentors
• Encourage having multiple mentors (e.g., mentor networks, peer mentoring, group mentoring)
• Make goals of mentorship (e.g., psychosocial support) explicit and anticipated outcomes
Recommended Mentorship Practices (2/2)

• Provide inclusivity-aware mentorship training

• Monitor progress and allow women to exit dysfunctional mentor-mentee relationships

• Recognize and reward mentorship, especially mentorship of women

• Connect women with online support communities
In General, We Find That...

- Mentees from underrepresented and marginalized groups often seek mentors who...
  - Are understanding and accepting of their whole selves
  - Who promote a culture of welcoming and openness
  - Engender a sense of belonging
  - Are able and willing to provide career mentoring and psychosocial mentoring as needed
What We Need
To Do
Take Action Now!

• Mentorship is something we can start taking action on **now**.
• In the long-run, RSEs would benefit from **explicit institutional support** for mentorship.
  - Formal mentorship programs,
  - Tailored training for RSEs who want to offer mentorship
  - Incentives for engaging in mentorship
  - Protected time for mentors and mentees to interact.
Mission of CIMER: To improve the research mentoring relationships for mentees and mentors at all career stages through the development, implementation and study of evidence-based and culturally-responsive interventions.
Highlight: Center for the Improvement of Mentored Experiences in Research (CIMER)

Complete Entering Mentoring Curricula

Curricula are organized by discipline. Each curriculum denotes the career stage of the mentee which whom the mentors work. Click on the magnifying glass to see a preview. Click on the lock to log in and download the curriculum as a PDF.

Tailored curricula for different disciplines and organizational contexts!

Facilitating Entering Mentoring
Practice Facilitation Activity #3
Maintaining Effective Communication

Practice Facilitator Instructions: You will have 15 minutes to facilitate this activity. To download a personal copy of this document that you can edit, go to File > Download.

Introduction:
Good communication is a key element of any relationship, and a mentoring relationship is no exception. As research mentors, it is an art to make us believe and contribute. A crucial element of effective communication and take time to practice communication skills in the session and with their mentors.

Learning Objective
2. Provide constructive feedback

Overview of Activities for the “Maintaining Effective Communication” Session

Learning Objectives: Case Activities:
1. Provide constructive feedback
Read and discuss the case scenario, “The Exit”

Electronic participant materials needed for session:
- Read scenario, “The Exit”

Interactive exercises with measurable learning outcomes!

Sessions Learning Objectives:
TBL: Share session learning objectives
Case Scenario: The Exit
Link to case scenario, “The Exit”
MSE: Ask a participant to read the case aloud or read the case to the Mentee.
Case Scenario: Instructions
TBL: Provide case scenario instructions (based upon how you decide to implement the discussion)
Case Scenario: Guiding Questions

Facilitator:
- Facilitate activity (e.g., open discussion verbally, type in chat boxes, etc.)
- Help/Teach Support
- Assist participants having challenges with any of the platform features
- Place any links to documents the facilitator refers to in theChat
- Provide feedback to the facilitator and facilitator feedback discussion
Mentorship Needs of RSEs

Interdisciplinary Mentorship Networks
Long-term Mentoring Relationships
Training Soft Skills

Interdisciplinary Mentorship Networks

• A unique trait of RSEs is their interdisciplinary backgrounds and the interdisciplinary character of their work.

• A unique requirement for effective RSE mentorship is the availability of multiple mentors across different domains.

• No single mentor will be able to supply the necessary organizational, engineering, and domain expertise to a new RSE.

**Need:** Interdisciplinary software engineers must be conversant in multiple disciplines. An effective network of willing software engineers, domain experts, and organizational culture mentors will boost an RSE’s confidence, skill set, and career growth opportunities.
Long-Term Mentoring Relationships

• Developers at major tech firms tend to hop between jobs frequently. At universities and national labs, professors and staff scientists may remain with the same institution for decades.

• If we intend to retain RSEs, we need a mentoring model that facilitates long-term, ongoing career growth.

• This is distinct from most mentorship programs in software industry, which focus on onboarding.

Need: Mentorship should not stop once an RSE shows a certain level of independence but instead needs to remain a high-level priority throughout the career of any RSE.
Training Soft Skills

- RSEs must communicate with domain experts, navigate research institutions as a software professional, and articulate software engineering best practices in the scientific domain.

- Soft skills are key to success. Unfortunately, RSEs almost never receive any formal training on applying those kinds of skills.

**Need:** Mentorship can and should include counseling mentees on relationships with colleagues, encouraging self-reflection, and lining up work opportunities to exercise soft skills.
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