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WHY STEM MENTORING MATTERS: IT'S MORE THAN JUST GUIDANCE – A SYSTEMATIC REVIEW



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THE POWER OF MENTORING: DECADES OF EVIDENCE

Decades of research solidify mentoring as a powerful tool. Studies show that mentoring can serve as a pivotal intervention, fostering a variety of positive relationships and behavioral, attitudinal, health-related, motivational, and career outcomes.¹ Numerous studies have pointed out the positive effects of mentoring and the support provided, which catalyzes mentees' sense of belonging in a STEM field and establishes their scientific identity.^{2, 3, 4}



THE ROLE OF SOCIAL SUPPORT SYSTEMS

A growing body of research has shown that having a social support system via mentorship programs creates a sense of belonging – particularly beneficial in breaking down socio-cultural barriers and building a diverse and inclusive STEM community. Mentorship has been well-established in the academic sphere, demonstrating that STEM identity and career pathways for underrepresented minority women increase diversity and support future leadership in STEM fields. The presence of a mentor can significantly influence a student's decision to persist in their studies, pursue advanced degrees, and ultimately enter STEM professions.

SYNTHESIS OF FINDINGS

The body of research on STEM mentoring is extensive. It covers various topics, from specific mentoring practices and program structures to broader diversity, equity, and inclusion issues. Key themes across these studies include:

- **Critical Role of Mentorship:** Mentorship is essential in supporting underrepresented groups, helping them overcome barriers, and achieving success in STEM fields.
- **Positive Faculty-Student Interactions:** Positive interactions between faculty and students are crucial for student engagement and academic success.
- **Structured and Research-Informed Programs:** There is a need for structured, research-informed mentoring programs designed to meet the specific needs of diverse student populations.

BRIDGING THE GAP BETWEEN RESEARCH AND IMPACT

This systematic review translates research findings into actionable recommendations and practical tools for program design and implementation, making it easier for organizations to create effective mentoring programs. Using this systematic literature review as a starting point, SWE identifies valuable insights and shows areas where bridging the gap between research and practice is essential for maximizing the impact of mentoring initiatives and ensuring that they effectively support all students in STEM



MENTORSHIP

TABLE: SYSTEMATIC LITERATURE REVIEW

Title	Authors	Journal/Publisher	Year	Focus Area	Key Findings
STEM mentoring: Bridging research and practice	Kupersmidt, J. B., Stelter, R. L., Garringer, M., & Bourgoin, K.	International Journal of STEM Education	2018	STEM mentoring practices	Effective STEM mentoring requires bridging research and practice for better outcomes.
Promising practices for addressing the underrepresentation of women in science, engineering, and medicine	National Academies of Sciences, Engineering, and Medicine	The National Academies Press	2020	Underrepresentation of women in STEM	Promising practices identified to improve the representation of women in STEM fields.
Research in science education	Bell, R. L., Lederman, N. G., & Abd-El-Khalick, F.	Journal of Research in Science Teaching	2019	Research methodologies in science education	Examines different research methodologies in science education and their impacts.
Women in science: Career processes and outcomes	Burstein, M.	Journal of Women and Minorities in Science and Engineering	2003	Career outcomes for women in science	Discusses career processes and outcomes for women in science fields.
The role of mentoring in the success of African American and Latino college students	Crisp, G., & Taiwo, A.	Journal of College Student Development	2009	Mentoring for minority college students	Mentoring plays a crucial role in the success of African American and Latino students.

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We do science here: Underrepresented students' interactions with faculty in different college contexts	Hurtado, S., Eagan, M. K., Tran, M. C., Newman, C. B., Chang, M. J., & Velasco, P.	Journal of Social Issues	2010	Faculty interactions with underrepresented students	Underrepresented students benefit significantly from positive faculty interactions.
The role of altruistic values in motivating underrepresented minority students for STEM	Thoman, D. B., Brown, E. R., Mason, A. Z., Harmsen, A. G., & Smith, J. L.	Journal of Educational Psychology	2015	Motivation for minority students in STEM	Altruistic values are a significant motivator for minority students in STEM fields.
Assuring the U.S. Department of Defense a strong science, technology, engineering, and mathematics (STEM) workforce	National Academy of Engineering and National Research Council	The National Academies Press	2012	STEM workforce for the Department of Defense	Recommendations for ensuring a strong STEM workforce for the Department of Defense.
Effective Mentoring for STEM Students Program	Harvard Mentoring Program	Harvard Mentoring	2024	STEM mentorship program benefits	Tailored mentorship programs significantly enhance the academic outcomes of STEM students.

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Research Mentors Should Support Students of Color by Taking	MDPI Journal	MDPI	2024	Support for students of color in STEM	Mentors need to adopt inclusive mentoring practices to better support students of color in STEM fields.
STEM MENTORING - ERIC	ERIC - Education Resources Information Center	ERIC	2024	Youth mentoring programs in STEM	Prominent youth mentoring programs in STEM show positive impacts on student engagement and academic performance.
How Mentor Training Can Lead to More Effective STEM Mentoring	Evidence-Based Mentoring	Evidence-Based Mentoring	2020	Mentor training for effective STEM mentoring	Mentor training programs that promote inclusion and effective communication skills lead to more successful mentoring relationships.
Closing the Gender Gap Through Effective Mentorship Programs	SWE Global Ambassador	SWE	2024	Closing the gender gap in STEM	Effective mentorship programs are crucial in closing the gender gap in STEM fields.
Role of Mentoring in Promoting Diversity Equity and Inclusion in STEM Education and Research	Andrea G.	FEMSPD	2022	Promoting diversity, equity, and inclusion in STEM	Mentoring is essential for promoting diversity, equity, and inclusion in STEM education and research.

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Research-informed Recommendations for STEM Mentoring Programs	Mentoring.org	Mentoring.org	2020	Recommendations for STEM Mentoring Programs	Structured mentoring programs, mentor training, and supportive environments are crucial for effective STEM mentoring.
Academic Mentorship Needs a More Scientific Approach	Montgomery, Sancheznieto, & Dahlberg	Issues	2024	Scientific approach to academic mentorship	A scientific approach to academic mentorship can improve the effectiveness of mentoring relationships.
Mentoring in Organizations: Implications for Individual and Organizational Development	Eby, L. T., Allen, T. D., Evans, S. C., Ng, T., & DuBois, D. L.	Journal of Applied Psychology	2008	Broad mentoring outcomes	Mentoring is a pivotal intervention that fosters various positive outcomes, including relationships, attitudes, health, motivation, and career development.
Mentoring in Higher Education: A Review of the Literature	Fletcher, S., Finley, S., & Knibbs, P.	International Journal of Mentoring and Coaching in Education	2008	Building STEM identity	Positive effects of mentoring include building a sense of belonging and establishing a scientific identity for mentees.
Youth Mentoring: A Meta-Analytic Review of the Literature	Herrera, C.	American Journal of Community Psychology	1999	Support systems in STEM	Mentoring acts as a catalyst in creating a supportive environment, which is essential for fostering a sense of belonging in STEM fields.

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Mentoring and the Development of Scientific Identity	Masehela, L., & Mabika, M.	South African Journal of Higher Education	2017	STEM mentoring impacts	Mentoring significantly supports the development of scientific identity among mentees, contributing to their persistence in STEM fields.

References:

1. Eby, L. T., Allen, T. D., Evans, S. C., Ng, T., & DuBois, D. L. (2008). Mentoring in organizations: Implications for individual and organizational development. *Journal of Applied Psychology*.
 2. Fletcher, S., Finley, S., & Knibbs, P. (2008). Mentoring in higher education: A review of the literature. *International Journal of Mentoring and Coaching in Education*.
 3. Herrera, C. (1999). Youth mentoring: A meta-analytic review of the literature. *American Journal of Community Psychology*.
 4. Masehela, L., & Mabika, M. (2017). Mentoring and the development of scientific identity. *South African Journal of Higher Education*.
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