1 **An effective workshop on "How to be an Effective Mentor for Underrepresented STEM**

2 **Trainees"**

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## Abstract

26     Despite an increase in programming to promote persons excluded by their ethnicity or race

27     (PEER) scholars, minorities remain underrepresented in many STEM programs. The academic

28     pipeline is largely leaky for underrepresented minority (URM) scholars due to a lack of effective

29     mentorship. Many URM students experience microaggressions and discrimination from their

30     mentors due to a lack of quality mentorship training. In this workshop, we provide a framework

31     for how to be an effective mentor to URM trainees. Mentees, especially URM trainees, can

32     flourish in effective mentoring environments where they feel welcomed and can comfortably

33     develop new ideas without feeling threatened by external factors. Effective mentoring

34     environments provide motivational support, empathy, cultural competency, and training.

35     **Keywords** Diversity, STEM, Professional Development, Higher Education, Mentorship,

36     Culturally Supportive, Cultural Competence

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**The framework of the workshop**

Designing an effective mentorship workshop requires examples of the characteristics of effective mentors of underrepresented minority (URM) trainees, a blueprint for selecting mentees based on the mentorship environment, and strategies for maintaining nurturing mentor-mentee relationships. Mentor-mentee relationships require navigating unique challenges to ensure the success of URM trainees. Frequently, URM students face microaggressions, imposter fear, and difficulties in building networks and mentorship relationships, which increase the risk of falling out of the academic pipeline (Hinton Jr *et al.* 2020a; National Academies of Sciences 2020; Shuler *et al.* 2021; Uddin and De Los Reyes 2021). Despite the nature of these challenges, based on scientific findings, URM trainees perform better under supportive mentorship relationships, which can help them overcome the daily challenges that deters them from staying in the academic pipeline (Hinton Jr *et al.* 2020a; Termini *et al.* 2021a).

During the workshop strategies were presented to help potential mentors identify best practices for effective and motivational mentoring. The importance of celebrating the mentee and their journey was emphasized in the workshop, in addition the mentor was provided strategies for identifying mentees in need of special guidance. These strategies encouraged mentors to reframe how they think about students, work to have a more authentic mentor-mentee relationships, and develop a motivation-based mentoring approach based on emotional intelligence (Gardenswartz, Cherbosque and Rowe 2010; Opengart and Bierema 2015; Montgomery 2017; Hinton *et al.* 2020; Hinton Jr *et al.* 2020b; Shuler *et al.* 2021).

In the workshop, all participants were presented with a model of intentional mentorship. This mentoring model emphasizes a willingness to learn and establish credibility while facilitating the

60    formation of positive relationships through networking (Shuler *et al.* 2021). Workshop

61    participants were also exposed to effective and ineffective mentorship practices (Neikirk 2021).

62    Furthermore, the workshop discussed using motivational mentoring as a way to cultivate the

63    mentee's spirit of excellence as they navigate their career development -- through the use of

64    individual development plans (IDP) (National Academies of Sciences 2020; Shuler *et al.* 2021).

65    These strategies are especially useful for mentees during times of hardship, such as classroom

66    challenges. (McReynolds *et al.* 2020; Termini *et al.* 2021b).

67

68    **Introduction**

69    Mentoring relationships are essential for the development of a mentee's career, especially those

70    from URM groups. Successful mentoring requires environments that bolster motivational

71    ambition, provides empathy, and utilizes cultural competency. Toxic mentoring environments

72    arise from poor communication, lack of commitment and experience, conflicting personalities,

73    perceived competition, poor perceived performance, and difficulty in forming interpersonal

74    connections with the mentee.

75    **Key goals for successfully mentoring diverse trainees:**

76        • Practice meditation and mindfulness

77        • Be aware of your own biases

78        • Create a positive environment

79        • Respond, do not react

80 • Promote self-motivation, encompass your inner resources to act, reach, and achieve goals

81 and aspirations

82 • Provide constructive, not deconstructive, criticisms

83 • Cultural competence

84 **Motivational Support: How to motivate and support diverse trainees simultaneously?**

85 Motivation is the inner drive to excel, which is often changed by internal and/or external conflict.

86 This inner drive is important for cultivating goals and providing direction. A trainee's motivation

87 governs the direction of the trainee's behavior in any mentoring environment, such as their

88 effort, grit, and attitude. Minority trainees not only face external barriers during their educational

89 and career journey, such as toxic mentorship and institutional inequities, but also experience

90 internal challenges, such as John Henryism (Rolle *et al.* 2021). Furthermore, URM also face

91 barriers including imposter fear, also known as imposter syndrome which is discussed in the

92 workshop as a stigmatizing word that places the issue on the individual as opposed to the

93 environment (Hinton Jr *et al.* 2020b; Rolle *et al.* 2021). These barriers stimulate a lack of

94 confidence, which affects their perseverance. Since all trainees have different motivations,

95 mentors should personalize their mentorship approach based on their mentee's goals and

96 motivations. A single mentorship strategy is often insufficient for a diverse group of mentees.

97 Mentees differ physically and emotionally, including in their motor, moral, and learning abilities.

98 Mentors set an example for their trainees. Quality mentoring comes from being an inspiration

99 (Shuler *et al.* 2021). Mentorship is an investment, not only to their institutions but to society as

100 their mentees may make substantial contributions (Hinton Jr *et al.* 2020b; Shuler *et al.* 2021).

101 Thus, the mentor's character can play a big role in how mentees view themselves. An inspiring

102    mentor listens, serves, shares, focuses on positivity, stays authentic, is willing to learn, and

103    remains humble. Minority trainees excel with positive reinforcement. Mentors foster positivity in

104    their relationships with mentees. Mentors must also identify and restrain negative beliefs that

105    may influence their guidance and be willing to accept constructive feedback.

106    **Providing support and empathy**

107    Mentors need to invest time in getting to know their mentees. Active listening is as important as

108    intentional mentoring. An effective mentor sets aside time to speak with their mentees and pays

109    attention to what they have to say (Shuler *et al.* 2021). Active listening, instead of passive

110    listening, entails action. For example, if your mentee makes you aware of a concern or question,

111    the mentor might not have an answer to a specific situation, which would require seeking out

112    advice from their network. Intentional listening is essential to effectively communicate with

113    mentees. For example, if a mentor does not completely understand their trainees' questions or

114    concerns, the mentor may consider asking for clarification, which ensures a clear line of

115    communication between the mentor and mentee (Shuler *et al.* 2021). Active listening also

116    requires avoiding distractions, such as emails, while providing their mentees with undivided

117    attention. Focus on clarifying the situation to best provide an answer or suggestion. It is also

118    important a mentor maintains an open mind. Obstacles and setbacks are a good way for mentees

119    and mentors to grow and develop their skills.

120    Furthermore, each challenge is unique. Although mentees may be of the same gender,

121    racial/ethnic background, socio-economic background, or school systems, they are all individuals

122    with different journeys and motivations. No racial/ethnic group is monochromic hence it is

123    essential to develop a personalized 'individual development plan' (IDP) (Hinton Jr *et al.* 2020b).

124    Effective mentors also seek to maintain transparency by breaking down communication barriers,

125    including seeking out alternative approaches, media, or technology to carry out conversations.

126    It is also important for mentors to focus on developing their emotional intelligence (EI), which is

127    also known as emotional quotient or emotional intelligence quotient (Hinton Jr *et al.* 2020b,

128    Shuler *et al.* 2021). EI is the ability of understanding feelings, emotional language, and signals

129    conveyed by emotions (Hinton Jr *et al.* 2020b, Shuler *et al.* 2021).. EI involves distinguishing

130    and managing our personal feelings and interactions from those of other people (Hinton Jr *et al.*

131    2020b, Shuler *et al.* 2021). EI assists with managing your behavior, navigating social areas, and

132    helping others make critical life choices (Hinton Jr *et al.* 2020b, Shuler *et al.* 2021). EI also helps

133    identify personal biases in thinking (Hinton Jr *et al.* 2020b, Shuler *et al.* 2021). It is like a

134    window to determine why a mentee or colleague behaves a certain way or avoids making certain

135    decisions. Practicing empathy towards their mentees can help mentors and mentees communicate

136    more efficiently.

137    **Cultural competency and training**

138    Cultural competence is the knowledge and skills needed to work with a diverse group in a

139    meaningful relevant and productive way. Cultural competence involves an understanding of the

140    role of religion, community, and culture in the lives and careers of underrepresented minority

141    mentees. Mentors should familiarize themselves with common racial insensitivities and develop

142    methods to ask questions on these topics with sensitivity & avoid perpetuating racial macro- and

143    microaggressions.

144    Based on these concepts, we tested how students perceived the information and whether  they

145    could apply it to their career development and individual development plan. In this particular

146 questionnaire, we used four questions to gauge interest. The questions consisted of a 10-point

147 scale that was based on rating the following concepts: overall presentation, support team, verbal

148 and nonverbal communication skills, and networking.

149

150    **Methods**

151    Twenty-four students from Winston-Salem State University (a historically Black public

152    university) attended a 90-minute virtual workshop. The participants completed an anonymous

153    questionnaire before and after the workshop to gauge their expectations and satisfaction

154    regarding the workshop (Table 1). The data were compared using nonparametric Wilcoxon

155    matched-pairs and signed-rank tests to determine differences between measures. Differences

156    were considered statistically significant when P values were less than 0.05. ****$P < 0.0001$;

157    ***$P < 0.001$; **$P < 0.01$; *$P < 0.05$; NS, not significant $P > 0.05$; NS (not significant).

158    **Results**

159         We summarized the data from the questionnaires using box and whisker plots in which

160    the red centerline denotes the median, and error bars denote the standard error. Individual values

161    are represented by circles. Overall, participant feedback was positive. Responses to the pre-

162    workshop questionaries suggest that mentees did not initially believe the workshop would be

163    beneficial (Figure 1A-D, Pre-Test). The data suggests that their low expectations may be a result

164    of low exposure or lack of mentorship.

165         Importantly, inconsistent mentorship may alter the mentee trajectories (Packard 2003;

166    Thomas, Willis and Davis 2007; Janis and Barker 2016). However, after the workshop, feedback

167    scores increased by an average of 5.2 points on a 10-point scale. The median score was a 9 or

168    higher for every question asked (Figure 1A-D, Post-Test), indicating that the workshop was

169    found favorable and helpful for identifying mentors or considering mentors for other parts of

170    their lives.

171   All post-workshop questionaries show a significant difference compared with pre-

172 workshop questions. Initially, on average, participants believed the workshop to be low to

173 moderately informative with an average evaluation of 4.1 (Figure 1A, Pre-Test). Following the

174 workshop, the average score increased by 4.8 to an overall average of 8.9, indicating most

175 participants enjoyed the workshop (Figure 1A, Post-Test). Similarly, the average initial score for

176 believing the workshop would help improve communication skills was 5.2 (Figure 1B, Pre-Test).

177 Post-workshop, the average score increased by 4.8 points to an average of 9.9 (Figure 1B, Post-

178 Test). The belief that the workshop would increase networking skills increased by 5.6 points; the

179 average pre-test score was 3.9, while the average post-test score was 9.5 (Figure 1C). More so,

180 initially, participants did not strongly believe the workshop would underscore the importance of

181 having a support team, giving an average score of 3.6 (Figure 1D, Pre-Test). Following the

182 workshop, this score rose by 5.7 to an average of 9.3 (Figure 1D, Post-Test). The metrics

183 measured showed that, on average, mentees found the workshop informative and beneficial to

184 developing their networking, communication, and collaboration skills (Figure 1A-D, Post-Test).

185   These workshops allow for trainees to explore concepts about adequate mentorship

186 (Figure 1A-D). It is possible to interpret the data that initially students did not see the benefit of

187 the workshop because they may have felt it was not specifically targeting them or irrelevant to

188 their goals of developing a career at the undergraduate level (Figure 1A-D, Pre-Test). It is

189 important to highlight that the students did achieve a sense of award from gleaning new

190 information about mentorship. Taken together, these results suggest that career development

191 workshops focused on mentorship may have a large impact on student development and

192 performance level at the undergraduate level (Figure 1A-D).

193 **Discussion**

194    Mentoring is an important aspect of a mentee's career, especially those from URM groups

195    (Hinton Jr *et al.* 2020a, 2020b). Taken together, the data from the questionnaire highlights the

196    need for more career development opportunities focused on mentorship. This workshop also

197    provided an opportunity for self-reflection for students to understand the importance of mentors

198    and how they may be an important asset to achieving career goals. This workshop also provided

199    a unique understanding of different mentoring practices, and which may be most effective or

200    ineffective in a mentee-mentor relationship. Initially, enthusiasm for this type of program was

201    low and students thought career development workshops were not essential to their development

202    (Figure 1A-D, Pre-Test). However, the post-test results suggest that the students found this

203    workshop offered a robust set of strategies and tools to use in their career development and an

204    understanding of what type of mentor-mentee relationships they may need (Figure 1A-D, Post-

205    Test).

206        Although our sample size was small, the data suggest that career development workshops

207    are important for career advancement. We would further speculate that career advancement can

208    be done within mentee-mentor relationships, as well as, through skill and knowledge-building

209    workshops. We also suggest that students that experience this workshop can improve their

210    overall skill set and help build an understanding of the need for introspection and evaluation of

211    what may be helpful in their career advancement.

212        However, our dataset does not reflect a large stratification of participants by race and

213    ethnicity, age, or sex. We suggest these workshops be given in other languages based on

214    institutional demographics to effectively communicate the importance of career development to

215    non-native speakers. Additionally, our study participants, although involved in STEM fields,

216    may not represent the entire student-body population. Thus, we suggest that this workshop and

217    others be used to create a series to further enrich undergraduate career development across a

218    wide variety of demographics. Equally, we suggest that workshops like these continue to be a

219    resource to individuals that do not have access to career development opportunities. These

220    workshops should be open access for others to disseminate the information and help broaden the

221    true participation and motivation needed to pursue a STEM career. Furthermore, additional study

222    is needed to identify additional areas that may aid in student success.

223    **Availability of data and materials:**

224    A PowerPoint presentation of the workshop is available in English and Spanish upon request.

225    Survey data may be made available upon reasonable request.

226    **Acknowledgements:**

227    We thank the 24 students who participated in our survey.

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236    Ethnic and Racial minorities (P.E.E.R), 21-MortonD-HSR-SOM-01, Kaiser Foundation

237    Research Institute FWA: FWA00002344

238    **Ethics Approval and consent to participate:** Yes

239    **Consent for publication:** Yes

240    **Competing interests:** Authors declare that they have no competing interests.

241

242    **References:**

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244        differences in the workplace. *Journal of Psychological Issues in Organizational Culture*
245        2010;**1**:74–84.

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256        century for STEM majors and beyond. *Nature Biotechnology* 2020;**38**:1477–82.

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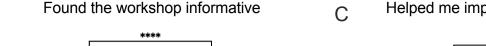292      **Table 1. Pre- and post-workshop evaluations.**

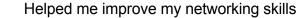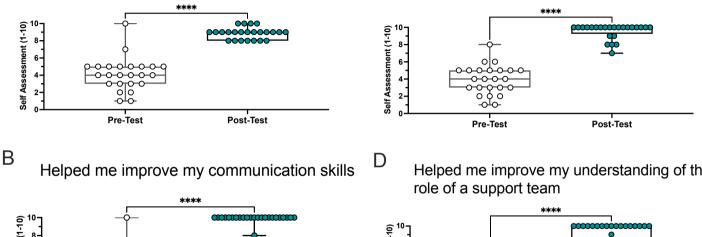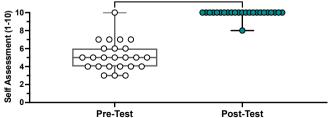| Pre-workshop survey questions | Post-workshop survey questions |
|---|---|
| On a scale of 1 to 10, do you think the presentation will keep you well informed? | On a scale of 1 to 10, how did you like the presentation? |
| On a scale of 1 to 10, how do you think the talk will improve your verbal and non-verbal communication? | On a scale of 1 to 10, how do you think the talk helped you improve your verbal and non-verbal communication? |
| On a scale of 1 to 10, how well do you think the talk will improve your networking skills? | On a scale of 1 to 10, how much do you think the talk helped you improve your networking skills? |
| On a scale of 1 to 10, how do you think the talk will improve your understanding of what a support team does? | On a scale of 1 to 10, how much do you think the talk helped you improve your understanding of what a support team does? |

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300    **Figure Legend 1. Results from pre- and post-workshop evaluations.** These pre- and post-

301    workshop questions were also used to evaluate mentees' knowledge regarding mentee-mentor

302    relationships. **A**. The informativeness of the workshop. **B**. How much the workshop improved

303    communication skills. **C.** How much the workshop improved networking skills. **D.** How much

304    the workshop improved understanding of support teams and assistive roles.

305

**A** Found the workshop informative

**B** Helped me improve my communication skills

**C** Helped me improve my networking skills

**D** Helped me improve my understanding of the role of a support team