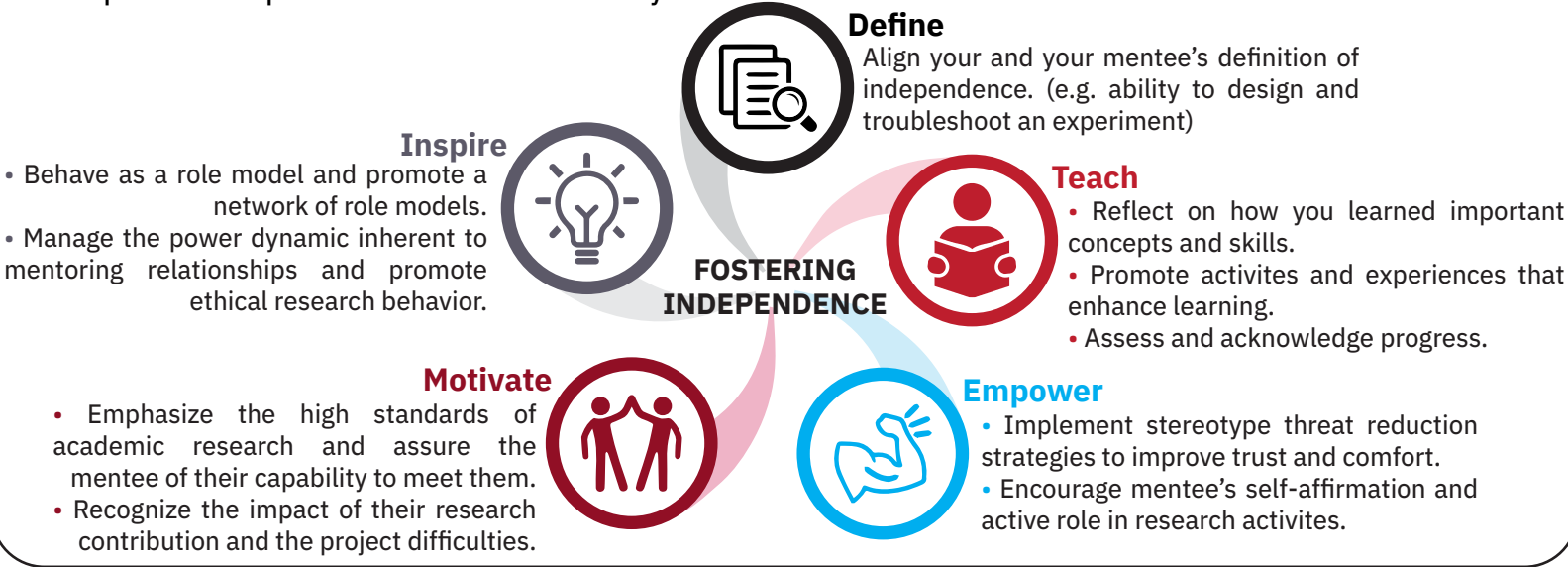


INTRODUCTION

This worksheet was designed by MIT Materials Initiative for Comprehensive Research Opportunity (MICRO) to provide guidance on defining and promoting independence of research mentees. The purpose of this worksheet is to define the goal and dynamic nature of independence, propose strategies to build the student's confidence, and create an environment where they can blossom as people and researchers.

DEFINING INDEPENDENCE AND ITS DYNAMIC NATURE ⁽¹⁾

Independence can have a broad range of definitions depending on personal experiences, as well as the stage of the mentoring relationship. Defining independence and its core elements, building the mentee's confidence, and creating an environment where they can achieve their goals are all important components of fostering independence. Reflect and discuss with your mentee on the process below to guide independence development and promote scientific creativity.



ESTABLISHING A NETWORK OF MENTORS: THE MENTORING MAP ^(1,2)

The identities of the mentor and mentee can greatly influence mentorship structure, research outcomes, and student retention.^(3,4) This is particularly important when their perceived social identities differ. Mentors should recognize this, and encourage their mentees to not rely solely on them. This section present two frameworks to establish networks of mentors.

A mentoring map⁽²⁾ is a tool to map one's current mentoring network, identify unmet needs, and plan how to expand the existing network to meet one's goals. **On the mentoring map on the right, identify your existing mentors for the categories laid out. Encourage and assist your mentee in filling out their own.**



Sources: (1) Entering Mentoring: First Edition, Christine Pfund, Janet Branchaw, and Jo Handelsman, W. H. Freeman, 2015, ISBN:9781464184901. (2) Mentoring map, National Center for Faculty Development and Diversity, <https://www.facultydiversity.org/ncfddmentormap>. (3) Trawick, C., et al., Pedagogy in Health Promotion, 7, 2021. (4) Aikens, M. L., et al., CBE - Life Sciences Education, 16, 2017.

ESTABLISHING A NETWORK OF MENTORS: THE INDIVIDUAL DEVELOPMENT PLAN ⁽¹⁾

An Individual Development Plan (IDP)⁽¹⁾ is a planning and communication tool that helps the mentee to clarify their research and career goals and communicate them with their mentor team. **You can use the following template to develop an IDP with your mentee.** Reviewing the plan over time provides opportunities to celebrate achievements, revise the goals, and ensure continuous engagement and progress.

Help the student define their research and career vision through the definition of long-term, medium-term, short-term, and immediate goals.

What competencies and skills will be needed to reach the goals? (e.g. *Scientific knowledge, research and technical skills, professional skills, leadership skills*)

What activities and experiences will enable acquiring these skills? (e.g. *Classes, training, research experience, conference/workshop participation*)

How will progress in mastering these skills be assessed? (e.g. *Feedback from mentor, successful experimental outcomes, peer review*)

Who will help to reach these goals and how? (e.g. *Research mentor, teachers, peers, family members*)

ENHANCING SELF-CONFIDENCE AND PROMOTING A GROWTH MINDSET ^(5,6)

A growth mindset is the idea that intelligence is not fixed and that knowledge and skills can evolve with time and practice. Promoting this incremental view of abilities is a powerful tool to mitigate stereotype threat and boost students' self-confidence, sense of belonging, and overall academic performance.^(5,6) Here is some guidance on how to promote a growth mindset and stay away from the negative effects of a fixed mindset.



Intelligence is a fixed quality

- Promote stereotype threat.
- Reduce engagement, receptiveness to feedback, and overall learning.



Intelligence is a dynamic trait

- Reduce stereotype threat.
- Improve self-confidence, sense of belonging, and overall learning.

Explain the growth and fixed mindsets, and emphasize the positive relationship between learning and a growth mindset.

Describe academic accomplishments as a process of acquisition and highlight that setbacks are a crucial part of the process and opportunities to try new things moving forward. Avoid linking success to "smartness" and failure to intrinsic limits in capabilities.

Think deeply about task design and framing. Strive for challenging, yet accessible. Scaffolding, emphasis on the purpose and greater context, and design for self-improvement all help to generate motivation.

Praise learning, not effort. While hard work should be recognized—whether resulting in success or failure—it is less important than identifying what is and is not working, and what to try next.

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