**Appendix: Additional Details On Effective Mentoring Practices**

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[Effective practices for mentors of students/trainees](#_ht3a0px2145a) 7

[Effective Practices For All Mentees](#_jsjs6agb1csy) 7

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[**Annotated Bibliography**](#_m12z2ivz3ckl) **8**

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# Create a reciprocal relationship and establish clear goals

## Effective Practices For All Mentors

* + 1. Support mentees to build the skills, confidence, and responsibility to be active and equal participants in their mentoring relationships (National Academies of Science, Engineering, and Medicine (NASEM), 2019, p. 107).
    2. Ideally, mentors must also perceive receiving benefits from the relationship: as a mentor, identify your purpose for being a mentor and articulate personal goals; that is, what do you hope to derive from the relationship? (Nick et al., 2012, p. 4-5).
    3. Work to motivate mentees, stimulate their creativity, acknowledge their contributions, and navigate their path toward independence (NASEM, 2017, p. 133-134; NASEM, 2019, Box 5.2, p. 104).
    4. Aid mentees in talking through their own thoughts and decisions regarding issues they may face (Biotechnology and Biological Sciences Research Council (BBSRC), 2016, p. 1).
    5. Set a pattern of communication to make sure regular connection occurs between you and your mentees (Nick et al., 2012, p. 5). Opportunities for informal check-ins can aid in building rapport and trust with mentees.
    6. Make expectations (e.g., knowledge, skills, abilities, outcomes) explicit and create a safe space for mentees to make their expectations explicit. Together, engage in negotiations to ensure that expectations of all parties can be met (NASEM, 2017, p. 133-134; NASEM, 2019, p.104-105).

## Effective Practices For All Mentees

* + 1. As a mentee, it is up to you to determine what is needed from the relationship and to ensure your mentor is aware of these needs.
    2. Clearly establish with your mentor a set of expectations and essential commitments. Problems in mentoring relationships most often occur because of misunderstandings and lack of explicit communication (The Regents of the University of Michigan (RUM), 2015, p. 13).
    3. Prepare prior to mentoring meetings by approaching them with an agenda of key topics that you wish to discuss (BBSRC, 2016, p. 4-5). Commit to setting meeting times and agendas to ensure a productive discussion (Columbia University, 2016, p. 12).

# Engage in formal and informal evaluation of the mentoring relationship

## Effective Practices For All Mentors

* + 1. Assess your skills for mentorship and determine your own developmental needs (Columbia University, 2016, p. 21).
    2. Keep a record of meetings as a measure of progress, accomplishment of goals, and for reference (Columbia University, 2016, p. 15-17).
    3. Engage in self-assessment and self-reflection of the mentoring relationship (NASEM, 2019, p. 104-105).

## Effective Practices For All Mentees

* + 1. Keep a record of the meetings as a measure of progress, accomplishment of goals, and for reference (Columbia University, 2016, p. 15-17).
    2. Engage in self-assessment and self-reflection of the mentoring relationship (NASEM, 2019, p. 104-105).

# Build a supportive environment

## Effective Practices For All Mentors

* + 1. Mentors who show positive regard and genuine caring engage in active listening, display empathy and trustworthiness, give encouragement, provide timely and authentic feedback, and create supportive environments (Nick et al., 2012, p. 5-6; NASEM, 2017 p. 133-134).
    2. Be approachable and available to mentees (BBSRC, 2016, p. 5), but recognize that communication styles, motivation, and ways of working differ, and work with mentees to accommodate such differences (Lee et al., 2007, p. 2; NASEM, 2019, Box 5.2, p. 104).
    3. Listen and be sensitive to mentees expressed concerns, changes in circumstances, work-life balance, cultural transitions (Lee et al., 2007, p.2).
    4. Acknowledge mentees as a person and a professional, and provide moral support (Nick et al., 2012, p. 6; BBSRC, 2016, p. 6).
    5. Maintain confidentiality when requested and appropriate and create an environment of compassion, understanding, trust and honesty (Lee et al., 2007, p.2; Columbia University, 2016, p.11-12; NASEM, 2017, p. 133-134).
    6. Promote mentee engineering/STEM identity, their identity as a faculty member, student, or postdoc in the department/college, and their sense of belonging (NASEM, 2017, p. 133-134).
    7. Be as enthusiastic about your mentees’ research as you are about your own (Lee et al., 2007, p. 1). Celebration, however large or small, is a powerful motivator (Lee et al., 2007, p. 4).

### Effective practices for mentors of faculty

* + 1. Facilitate mentees’ participation within the department, institution, and any other communities they’re a part of (e.g., make introductions, clue the mentee in to underlying currents and news within the department, etc.)

# Be culturally responsive and bridge culture gaps

## Effective Practices For All Mentors

* + 1. Don’t assume your personal experiences are the experiences of others, learn different perspectives from your own (RUM, 2015, p. 24).
    2. Practice (and help your mentees in developing) a variety of diversity- and culturally focused skills such as advancing equity and inclusion, being culturally responsive, reducing the impact of bias, reducing the impact of stereotype threat, etc. (NASEM, 2017, p. 133-134).
    3. Proactively recognize and seek to mitigate factors that negatively impact mentees with marginalized and intersecting identities (e.g., race, gender, sexuality, and ability) (Lee et al., 2007, p. 2; Columbia University, 2016, p. 14).
    4. Be aware of mentees who seem to find it difficult to take active roles in academic or social settings and find ways to include them (RUM, 2015, p. 23).
    5. Develop listening skills and willingness to work outside of “comfort zones,” across boundaries of gender/race/ethnicity/sexual orientation/culture/religion (Columbia University, 2016, p. 12).
    6. Respect personal boundaries (Columbia University, 2016, p. 12).

### Effective practices for mentors of students/trainees

* + 1. Students from historically underrepresented or marginalized groups have a harder time finding faculty whose background and experiences may have been similar to their own and can feel particularly isolated or alienated from other students in their departments (RUM, 2015, p. 20). Take the initiative to talk with marginalized mentees. Ask them about their research interests, hobbies and activities outside of school, introduce them to other mentees and faculty with complementary interests (RUM, 2015, p. 23).

## Effective Practices For All Mentees

* + 1. Develop listening skills and willingness to work outside of “comfort zones,” across boundaries of gender/race/ethnicity/sexual orientation/culture/religion (Columbia University, 2016, p. 12).
    2. Respect personal boundaries (Columbia University, 2016, p. 12).

### Effective practices for student/trainee mentees

* + 1. Work with your faculty mentors to get names of other people in your department, across the university, or at other universities who may have had experiences similar to yours (RUM, 2015, p. 19) and ask your mentors or peers to introduce you to students and faculty with complementary interests (RUM, 2015, p. 20).

# Provide career guidance

## Effective Practices For All Mentors

* + 1. Build in regular occasions with your mentees to discuss their strengths, weaknesses, and appropriate options for professional growth and career goals (Sorcinelli, 2000, p. 12). Follow-up with regular check-ins to provide clear, honest, and constructive feedback on their progress toward their educational/career goals (orient to development, not evaluation) (Sorcinelli, 2000, p. 8).
    2. Help identify career advancement opportunities that mentees may not be aware of or know how to find (Nick et al., 2012, p. 6).

### Effective practices for mentors of faculty

* + 1. Within the first and subsequent years, review with candidates for tenure the steps in the MCEN process such as who evaluates and on what time schedule, the kinds of information needed for tenure files, and what pieces the candidate is responsible for collecting and submitting. Help mentees set challenging and realistic goals in relation to these requirements (Sorcinelli, 2000, p. 7).

### Effective practices for mentors of students/trainees

* + 1. Mentor your graduate students through each step of the process to completion of their graduate degree
    2. Prepare mentees’ for seeking jobs by informing them about academic and other career options, helping them search for positions, and by helping them in creating resumes and preparing for job interviews (Sorcinelli, 2000, p. 12; NASEM, 2017, p. 133).
    3. Build in regular opportunities with your mentees to discuss career plans. Help them develop a network and connect them with the resources they need to prepare for their desired career.
    4. Make an effort to develop research careers of mentees by encouraging them to attend national and international conferences, helping them find such conferences that best match their research and career goals, and introducing them to other researchers in their field (Lee et al., 2007, p. 6).
    5. For mentees who are interested in academic positions, introduce them to the process of tenure review, e.g., the kind of info needed for tenure files and who is responsible for collecting and submitting information.

# Engage in collective efforts to develop a variety of skills

## Effective Practices For All Mentors

* + 1. Value and practice ethical behavior and responsible conduct of research (NASEM, 2017, p. 133-134).
    2. Help mentees to access resources that will be helpful to their professional development (e.g., through teaching and learning centers or other campus-wide organizations) (Sorcinelli, 2000, p. 14; NASEM, 2019, Box 5.2, p. 104).
    3. Help mentees strategize about building their reputation, life balance, and teaching/research/service balance. Guide mentees on how to create boundaries so that professional activities do not blur into personal time (Nick et al., 2012, p. 6).
    4. Build in regular check-ins with your mentees to provide clear, honest, and constructive feedback on their work (orient to development, not evaluation). Particular occasions this may be helpful is after a mentee has received external feedback (e.g., a response to a manuscript submission, committee feedback on their proposal, thesis, dissertation, etc.) - help talk them through the feedback and put it in context.
    5. Engage in a process of observation/feedback with faculty, graduate student, and postdoc mentees who are teaching courses. Share your class materials and resources and invite them to visit your classes (Sorcinelli, 2000, p. 14). Provide early, supportive feedback on teaching; e.g., by engaging in formative peer observation of their classes, assisting them in self-reflection of their teaching practices, and reviewing/providing feedback on student and colleague evaluations, teaching statements, and teaching portfolios (Sorcinelli, 2000, p. 14). The procedure for classroom observations section of the MCEN peer teaching evaluation procedures and the MCEN peer observation protocol can be used to guide this process. It may also be productive for the mentor and mentee to review the MCEN teaching statement guidelines as an aid to reflecting on teaching practices and goals (all three documents can be found on the [MCEN Faculty & Staff Resources](https://www.colorado.edu/mechanical/faculty-staff-resources) webpage under “Department Rules & Guidance”).

### Effective practices for mentors of students/trainees

* + 1. Introduce mentees to the culture of discipline specific research and help them develop disciplinary research and technical skills and the skills to self-monitor their progress and accurately assess their understanding of such knowledge and skills. Provide clear feedback on their progress (Lee et al., 2007, p. 5; NASEM, 2017, p. 133-134).
    2. Guide mentees in developing their writing, presentation, and other communication skills. Postdocs and PhD candidates in particular may benefit from coaching on the process of writing papers and proposals, including how to deal with feedback from reviewers.
    3. Prepare mentees for their role as peer reviewers in the future, e.g., by having them dissect and write reviews of relevant current papers and then provide feedback on their efforts (Lee et al., 2007, p. 5).
    4. For mentees without formal teaching assignments who are interested in teaching, provide opportunities (or help them find opportunities) for them to do guest lectures, presentations, facilitating discussions/group work, etc.
    5. Facilitate mentees’ participation within the lab or other research environment (NASEM, 2017, p. 133) and help them develop their own skills as mentors of students/beginners.

## Effective Practices For All Mentees

* + 1. Actively identify specific developmental goals that your mentor can help guide you in, and invest time and energy to achieve them (Columbia University, 2016 , p. 7).
    2. Solicit and consider thoughtful and constructive feedback (Columbia University, 2016, p. 12).
    3. Update your mentor on interim activities related to your academic performance and career development - discuss progress in each career development domain and agree on goals/strategies/deliverables for the next period (Columbia University, 2016, p. 15).

### Effective practices for student/trainee mentees

* + 1. Develop Individual Development Plans that require you to think through your short- and long-term career plans and formulate a path to enact the plans with support from your mentor (NASEM, 2019, p. 108).

# Advocate

## Effective Practices For All Mentors

* + 1. Mentors should advocate for and guide mentees by supporting and acting for mentees’ benefit and speaking up on their behalf (Nick et al., 2012, p. 6).
    2. Facilitate mentees’ socialization and integration into the discipline, department, and/or university culture by introducing them to potential collaborators and helping them establish and foster professional networks (Lee et al., 2007, p. 6; Nick et al., 2012, p. 6; NASEM, 2017, Fig 5.1 p. 134).
    3. Support your mentees when they are creating their boundaries with other people
    4. Write strong recommendation letters for your mentees. Pay attention to and seek to avoid inadvertently incorporating gender and/or racial biases into your letters. For example, some suggestions include: mentioning research and publications, emphasizing accomplishments over effort, avoiding stereotypes, and being careful about raising doubts (University of Arizona, 2016; Berhe and Kim, 2019).

### Effective Practices For Mentors Of Students/Trainees

* + 1. Make others aware of mentees’ achievements and work (Lee et al., 2007, p. 6).
    2. Provide, seek out, or help mentees find financial support for research and conference related travel (Lee et al., 2007, p. 6).
    3. When you see mentees taking on spokesperson roles, tell them and others what you have gained from their contributions to the discussion (RUM, 2015, p. 24).

## Effective Practices For All Mentees

* + 1. Commit to developing scholarly independence (Columbia University, 2016, p. 12).
    2. Collaboratively develop appropriate goals and meeting expectations, and take responsibility for the hard work and integrity necessary to develop academic independence (Columbia University, 2016, p. 15).

### Effective practices for student/trainee mentees

* + 1. Analyze what you need from an individual faculty member and explicitly ask for assistance that will help you address that need (RUM, 2015, p. 11).
    2. As you develop your mentoring relationships, be clear with the faculty about the range of your research interests (RUM, 2015, p. 20).

# Mitigate Negative Experience

## Effective Practices For All Mentors

* + 1. Help to cultivate a relationship of trust that encourages mentees to communicate negative experiences.
    2. Much of the guidance included in the first 7 principles above is expected to help mitigate negative experiences, in particular working together with your mentee to set and revisit expectations; providing regular support, feedback, and guidance related to research, teaching, and education/career goals; providing encouragement especially when things go wrong; and by reflecting on your behavior as a mentor and how it may be perceived by your mentee(s) (Limeri et al., 2019).

### Effective practices for mentors of students/trainees

* + 1. If you find that you are frequently unavailable to research trainee mentees, particularly undergraduate researchers, those new to your research group, or those who otherwise may need scaffolding toward independent work, seek out additional mentors such as other faculty or senior graduate students / postdocs who could also support your mentee(s) (Limeri et al., 2019).

## Effective Practices For All Mentees

* + 1. Situations occasionally arise for your faculty mentor that could impede your work and progress. For instance, other demands on your mentor may hinder their ability to meet with you or provide prompt feedback about your work. If something like this happens repeatedly, you should talk about this with the mentor involved. Do this in person, when it first becomes evident that there is a problem. Face-to-face (in person or virtual) meetings can lead to more satisfactory results than e-mail, since one’s tone and message can be easily misconstrued when communicating online or even by phone (RUM, 2015, p. 15).
    2. Recognize that a single mentor is unlikely to be able to provide all the mentoring functions you may need; be proactive in seeking out additional mentors so that collectively you can get mentorship that meets your needs (Limeri et al., 2019).

### Effective practices for student/trainee mentees

* + 1. If issues happen to you, be sure to take the initiative and contact (and recontact) your mentors. Discuss your situation with them, providing the information you feel they need to know (RUM, 2015, p. 15).

# Annotated Bibliography

Note: the numbers in brackets preceding the resources (e.g., [zip17], [zip18]) refer to the references included in the zip file “Resources for mentoring” available by request from [insert contact name and email]. MCEN faculty can also find them in Canvas [insert appropriate link after files have been added].

[zip17] Anderson, L., Silet, K., & Fleming, M. (2012). Evaluating and Giving Feedback to

Mentors: New evidence based approaches. Clinical and Translational Science 5(1), 71-77. <https://doi.org/10.1111/j.1752-8062.2011.00361.x>. *[Six-component approach to mentor evaluation: training and empowerment, peer learning and mentor training, scholar advocacy, mentee–mentor expectations, mentor self-reflection, and mentee evaluation of their mentor]*

[zip18] Berhe, A. A., & Kim, S. (2019). Avoiding racial bias in reference letters. *[Guidance for avoiding racial bias communicated through reference letter writing]*

[zip19] Biotechnology and Biological Sciences Research Council (BBSRC) (2016). Academic career mentoring and best practice for formal mentoring programmes. *[Guidance on establishing mentoring relationships, including initiation, review, and closure of the mentoring relationship]*

[zip20] Caddick, P. (2009). Who is Holding the Rope for You? Building Effective Mentoring

Relationships Mentoring Workbook. *[Guidance, scenarios, assessment tools and*

*techniques for mentors and mentees to help them evaluate and build their relationship]*

[zip21] Center for Advancement of Informal Science Education (CAISE) (2018). Identity in Science and STEM: Reflections on Interviews with the Field. *[Guidance on the definition, importance, measurement, and support of STEM identity]*

[zip22] Columbia University Office of the Provost (2016). Guide to Best Practices in Faculty Mentoring. *[Guidance for mentors and mentees on developing an effective mentoring relationship for mentors and mentees, with attention to mentoring diverse faculty]*

[zip23] Lee, A., Dennis, C., & Campbell, P. (2007). Nature’s guide for mentors. Nature*,* 447(7146), 791-797. <https://doi.org/10.1038/447791a> *[Mentor and mentee reflections on “good” mentoring. Includes a mentor self-assessment]*

[zip15] Limeri, L. B., Asif, M. Z., Bridges, B. H. T., Esparza, D., Tuma, T. T., Sanders, D.,

Morrison, A. J., Rao, P., Harsh, J. A., Maltese, A. V., & Dolan, E. E. (2019). “Where’s My Mentor?!” Characterizing Negative Mentoring Experiences in Undergraduate Life Science Research. CBE—Life Sciences Education, 18:ar61, 1-14. <https://doi.org/10.1187/cbe.19-02-0036> *[Assistance for reflecting on ways mentor behaviors might be perceived as harmful or unhelpful]*

[zip24] National Academies of Sciences, Engineering, and Medicine (NASEM) (2017). Chapter 5 in: Undergraduate Research Experiences for STEM Students: Successes, Challenges, and Opportunities. National Academies Press (pp 129-145). <https://doi.org/10.17226/24622> *[Supportive data for mentoring effectiveness on academic success and persistence in STEM]*

[zip25] National Academies of Sciences, Engineering, and Medicine (NASEM) (2019). Chapter 5 in: The Science for Effective Mentorship in STEMM*.* National Academies Press (pp. 103-125). <https://doi.org/10.17226/25568> *[Guidance on mentor/mentee behaviors and education guidance for training mentors/mentees. Interactive version: https://www.nap.edu/resource/25568/interactive/mentorship-defined.html]*

[zip26] Nick, J. M., Delahoyde, T. M., Del Prato, D., Mitchell, C., Ortiz, J., Ottley, C., Young, P., Cannon, S. B., Lasater, K., Reising, D., & Siktberg, L. (2012). Best Practices in Academic Mentoring: A Model for Excellence. <https://doi.org/10.1155/2012/937906> *[Guidance on establishing a formal mentoring program with attention to institutional culture and career attainment]*

[zip27] The Regents of the University of Michigan (RUM) (2015). How to Get the Mentoring You Want: A Guide for Graduate Students. *[Resource for graduate students to improve the quality of their relationships with faculty. Includes discussion for underrepresented students]*

[zip28] Tonso, K. (2014). Engineering Identity. In A. Johri & B. Olds (Eds.), Cambridge Handbook of Engineering Education Research (pp. 267-282). Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9781139013451.019> *[Synthesis of literature on the development of an engineering identity and the role of engineering identity in fostering a sense of belonging as an engineer]*

[zip29] Shea, G. F. (1994). Mentoring: Helping employees reach their full potential. AMA Membership Publications Division, American Management Association. p.13-24 *[Justification for the renewed interest in mentoring]*

[zip30] Schulz, A. J., Israel, B. A., & Lantz, P. (2003). Instrument for evaluating dimensions of

group dynamics within community-based participatory research partnerships. Evaluation and Program Planning 26, 249-262. <https://doi.org/10.1016/S0149-7189(03)00029-6> *[Development of an evaluation tool to assess group dynamics. Sample items from the survey are included in Appendix A ]*

[zip31] Sorcinelli, M. D. (2000). Principles of Good Practice: Supporting Early-Career Faculty. Guidance for Deans, Department Chairs, and Other Academic Leaders. AAHE, Forum on Faculty Roles & Rewards, Washington, DC. *[Concise guide that provides content on leadership encouraging positive relationships with colleagues and students as well as easing time/balance stresses]*

[zip32] University of Arizona (2016). Avoiding Gender Bias in Reference Letters *[Guidance for*

*avoiding gender bias communicated through reference letter writing]*