This document describes the mentoring activities of the Faculty Development Program (FDP)2 and provides guidance to all mentors and mentees in Mechanical Engineering, regardless of their status (e.g., faculty or trainee) or participation in the FDP.

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# What is Mentoring?

Shea (1994) defines **mentoring** as: "A developmental, caring, sharing, and helping relationship where one person invests time, know-how, and effort into enhancing another person's growth, knowledge, and skills and responds to critical needs in the life of that person in ways that prepare the individual for greater achievement in the future."

Mentoring relationships help integrate new faculty (tenure and non-tenure track), undergraduate and graduate students, postdocs, etc., into the department and institution and STEM community and can help more senior faculty when they are transitioning to new roles (Columbia University, 2016). As such, mentorship is essential to the holistic development of engineers and other STEM professionals, including the development of a strong identity as an engineer, mathematician, scientist, etc. (National Academies of Science, Engineering, and Medicine (NASEM), 2019). In order to be successful, **mentoring requires active committed engagement** on the part of both mentor and mentee: mentors need to be able to invest time for guidance on an ongoing basis and mentees need to identify specific developmental goals (with the help of mentors) and invest time and energy to achieve them (Columbia University, 2016). The most effective relationships occur when rapport is built and both parties enter a stage of familiarity and trust. Clear and sustained communication, rapport building and a positive attitude are all important components of achieving the most out of a mentoring relationship.

Mentoring can take many forms, such as culturally responsive mentoring, career mentoring, informal mentoring, and trainee mentoring (described more below) - the principles and suggestions in this document are expected to apply to all. **These forms of mentoring are not mutually exclusive**. Further, culturally responsive practices should be infused across all forms of mentoring.

**Culturally responsive mentoring** can help mentees feel more connected to their field of study, research, colleagues/peers/mentors, department, and institution. Mentors from all backgrounds can develop attitudes, behaviors, and practices that help them understand power dynamics and the impacts of social identities on students’ and faculty experiences in STEM and better enable them to work with mentees with different cultural backgrounds (NASEM 2019) (See [4. Be culturally responsive and bridge culture gaps](#_bi7jn6ay2usi) for a summary and the [appendix](https://docs.google.com/document/d/1vijtggPpc_twpwEIgQdwY7FWZ7B6MaJt9XTicx1qb7Y/edit?usp=sharing) for more information)

**Career mentoring** is a type of professional mentoring that mostly focuses on career related advice. Such mentoring should “help mentees successfully acquire the key competencies (scholarly independence, educational skills, and preparation for academic advancement), as well as the constructive professional relationships (professional networks) within the institution and beyond needed to develop a productive career” (Columbia University, 2016) (See [5. Provide Career Guidance](#_2n4hq4b2txub) below for a summary and in the [appendix](https://docs.google.com/document/d/1vijtggPpc_twpwEIgQdwY7FWZ7B6MaJt9XTicx1qb7Y/edit?usp=sharing) for more information).

**Informal mentoring relationships** often form organically as a result of shared interest and/or perceived commonality in some aspect of career goals and can be complementary to formal relationships by supporting different aspects of career guidance from a broad array of mentors (Columbia University, 2016).

Effective **student and trainee (e.g., postdoc) mentorship** plays a critical role in developing a science identity “by contributing to the socialization and integration of students into scholarship and academe as a community” (NASEM, 2019). Because the development of a science identity is a strong predictor of who will continue on to graduate school and beyond in STEM fields, it is important that faculty, departments, and institutions enable mentoring experiences that help students and trainees feel that they belong and are included in scientific culture (NASEM, 2019).

# Mentoring in Mechanical Engineering at CU Boulder

A **mentor** is a person who has knowledge, skills, information, and experience as a faculty member at the University of Colorado and is willing and able to share these in order to help the mentee’s professional growth and to become part of the University community. Specifically, **mentors of faculty** must be knowledgeable about the Mechanical Engineering Department and the College of Engineering and Applied Sciences operation, rules, and policies, and within the first and subsequent years, should review the steps in the MCEN process for promotion and tenure with their mentee(s). In subsequent years, a mentor would also focus on additional growth and leadership opportunities throughout the University and larger scientific community.

**Faculty mentees** are typically pre-tenured and untenured faculty or instructors with less than 7 years experience at the University of Colorado. **Trainee mentees** are typically undergraduate students, graduate students, doctoral students, or post doctoral researchers with whom the mentor works directly. Mentoring, however, can be very valuable for a faculty member’s career past tenure and additional opportunities arise.

**Regardless of whether the mentees are faculty or trainees,** mentors support their mentees by providing them with an appreciation of the workplace culture and the challenges of the profession. Mentors offer their time to provide support. A mentor also acts as an adviser and resource person. Mentees are looking for many things, including bridging the gap between being a doctoral student/postdoc and entering the academic workplace, being a successful faculty member, feeling fulfilled by their job, receiving guidance on future educational and/or career pathways, and getting help to set and refine challenging but realistic educational/career goals (Sorcinelli, 2000; NASEM, 2017; NASEM, 2019).

Mentees use mentors as a resource for their own self-development. **Mentees are the drivers of the relationship** and ideally take most of the responsibility for their self-directed learning and exploration. **Faculty mentees** are expected to learn about the operation and the rules and policies of the Mechanical Engineering Department and the College of Engineering and Applied Sciences.

Mentors generally have the best intentions. It is, however, the mentee who is ultimately responsible for their careers.

**For mentors/mentees in the formal Faculty Mentoring Program**, mentors will visit the mentee’s classroom and observe their teaching at least once a year for regular faculty and once a semester for instructors. The “MCEN peer observation protocol” and the procedure for classroom observations section of the “MCEN peer teaching evaluation procedures” 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”. MCEN faculty can also go to the Canvas site CU Mechanical Engineering Faculty Resources). The mentor will offer feedback and constructive suggestions verbally. A short report will be written by the mentor, and discussed with the mentee. These reports will serve as part of the “living” record of teaching accomplishments, and copies of the reports will be maintained in the mentee’s personnel folder.

**Faculty in informal mentoring relationships and those mentoring graduate students and postdoc trainees** are encouraged to engage in a similar process of observation/feedback with mentees who are teaching courses and/or encourage their mentees to observe and discuss their mentor’s own classes using the resources above.

# Summary: Mentoring Relationship Foundational Principles and Effective Practices

The following summarizes some effective mentoring practices for all mentors and mentees within eight principles of quality mentoring. These principles are not mutually exclusive - attending to some may have positive impacts on other aspects of quality mentoring, e.g., being a culturally responsive mentor can help build a supportive environment and mitigate negative experiences. Additional details on effective practices within each principle, including specific guidance (where applicable) for mentors of faculty, mentors of trainees, faculty mentees, and trainee mentees can be found in the appendix (see separate document). For mentors, note that the following are guidelines and suggestions - it is not expected that as a mentor you must do everything listed.

## Create a reciprocal relationship and establish clear goals.

Mentees and mentors engage as partners through reciprocal activities benefiting both participants such as planning, acting, reflecting, questioning, problem solving, and exchange of ideas and input (Nick et al., 2012, p.4-5; NASEM, 2017, p. 130). Together, mentors and mentees make expectations explicit, ensure that expectations of both parties can be met, and that both are active and equal participants in the mentoring relationship (NASEM, 2017, p. 133-134; NASEM, 2019, p. 104-105, 107). At the first mentoring meeting the relationship goals of both the mentee and the mentor should be discussed, along with how they will collaborate to achieve these goals. In addition to “broader topics such as the overall aims of the relationship, practical aspects of the relationship should also be established early on so that those involved know how frequently they will meet in person and how much contact via email and phone can be expected”(Biotechnology and Biological Sciences Research Council (BBSRC), 2016, p.6). “Problems that can occur as a result of mentees feeling they are creating an unnecessary burden and are bothering their mentor unduly can be avoided if at the start of the relationship it is established how much time the mentor is willing to commit” (BBSRC, 2016, p.6).

## Engage in formal and informal evaluation of the mentoring relationship.

Mentors and mentees should prepare for and seek to develop their relationships by identifying challenges and asking for feedback related to relationship effectiveness (Nick et al., 2012, p. 5; NASEM, 2019, p. 104-105). In particular, mentors and mentees have committed to meeting at least once a semester for an open conversation about how things are going. It is recommended that mentors and mentees consider some of the [resources for assessing the mentoring relationship](#_qvsr4398t5uk) below as a way to reflect on and assess the mentoring relationship as part of this conversation.

## Build a supportive environment.

The importance of creating a supportive environment where both parties are willing to be open, take risks, and collaborate cannot be overstated. In this supportive climate, mentees feel free to exercise independent thinking and a willingness to be creative, to offer ideas for consideration, and to verify lines of reasoning with their mentors. Mentors who show positive regard and genuine caring engage in active listening, display empathy and trustworthiness, give encouragement, and provide timely and authentic feedback (Nick et al., 2012, p. 5-6; NASEM, 2017, p. 133-134). Mentors should also promote mentee engineering/STEM identity (their combination of technical and social development that marks them as belonging to a group of people that practice engineering (Tonso, 2010) and their sense of belonging in the department/college and the STEM/engineering community (NASEM, 2017, p.133-134).

## Be culturally responsive and bridge culture gaps.

Mentors and mentees reflect on and account for their biases and assumptions they might have about those with different backgrounds than them and strive to improve their ability to bridge culture gaps by building listening skills and a willingness to work outside of “comfort zones” and across boundaries of gender, race, ethnicity, sexual orientation, culture, religion, etc. (Lee et al., 2007, p. 2; Columbia University, 2016, p. 11-12, 14; NASEM, 2019, Box 5.2, p.104). Mentors should proactively recognize and seek to mitigate factors that negatively impact mentees with marginalized and intersecting identities (e.g., gender, ethnic, or racial identity). Intersectionality means “a person’s various identities can be reinforcing or in competition with one another” and can intersect to influence an individual’s STEM/engineering identity) (CAISE, 2018, p.2). Engaging with identity, both of the mentor and mentee, can help to create a reciprocity of trust (Nganga , Bowne, & Stremmel, 2020).

## Provide career guidance.

Mentors and mentees engage in conversation around future education or career pathways to set and refine challenging but realistic goals. Mentors should build in regular occasions with mentees to discuss their strengths, weaknesses, and appropriate options for professional growth and career goals (Sorcinelli, 2000, p.12). Mentors can also “identify career advancement opportunities that mentees may not be aware of or know how to find” (Nick et al., 2012, p.6). Details of career advice for mentees may differ in terms of educational and career goals and their current positions. For example, guiding graduate students through each step of the process to completion of their degree, coaching postdocs on how to create a professional network and write grant proposals, and helping faculty through the tenure process.

## Engage in collective efforts to develop a variety of skills.

Mentors and mentees work together to understand what the mentees know and are capable of, identify specific developmental goals that mentors can help guide mentees in, determine a plan of action to meet those goals/develop skills, and invest time and energy to achieve them (Columbia University, 2016, p7; NASEM, 2019, Box 5.2, p.104).

## Advocate.

Mentors hold a level of power that their mentees may not. It is important that this experience and influence is harnessed to advocate for a mentee's professional welfare and amplify their mentee's access to opportunity, when appropriate. Mentors can facilitate mentees’ socialization and integration into the discipline, department, and/or university culture by introducing them to potential collaborators, 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), and supporting them when they are creating boundaries. When appropriate and as it meets mentee needs, mentors can further support mentees in advancing their career by providing them with strong letters of recommendation that avoid gendered/racial bias (University of Arizona, 2016; Berhe & Kim, 2019).

## Mitigate Negative Experience.

Mentor/mentee relationships can sometimes be affected by negative mentoring experiences even when the overall relationship is positive. Such experiences often arise from good intentions by mentors and mentees but may have negative impacts on the relationship and/or on the individuals involved. When such experiences arise it is important to examine them so that mentors/mentees can address and avoid harmful mentoring behaviors (NASEM, 2019). Mentors should cultivate a relationship of trust that encourages mentees to communicate negative experiences. 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 reflecting on your behavior as a mentor and how it may be perceived by your mentee(s) (Limeri et al., 2019). See [resources for identifying and mitigating negative experiences](#_6hlb2ztxqyom) below for more information.

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# Resources

## Departmental Resources

The department of Mechanical Engineering will host one social event a semester for the formal Faculty Mentoring Program. The personnel committee will loosely monitor mentor-mentee interactions to ensure new faculty are finding satisfactory support, and will offer assistance identifying resources to support grant writing or teaching improvements.

## Campus Resources

The Dean’s office and other units across campus offer workshops for pre-tenure faculty on the promotion and tenure process, identifying funding sources, and teaching improvements. The Center for Teaching and Learning (CTL, <https://www.colorado.edu/center/teaching-learning/>) offers workshops and one-on-one consultations to improve teaching effectiveness.

## Resources for assessing the mentoring relationship

Note: the numbers in brackets preceding the resources (e.g., [zip1], [zip2]) 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].

### Survey (Likert-type or checklist style)

#### Mentee evaluating mentor

* + [zip1] Center for Clinical and Translational Science Mentor Evaluation Form (UC Davis) *[Intellectual and professional development, academic guidance, personal communication, role model]*
	+ [zip2]The Global Measure of Mentorship Practices (box 6.2, p. 137 in NASEM, 2019) *[Assessment of 10 behaviors of career and psychosocial support specified to mentees in postsecondary STEMM]*
	+ [zip3]Mentoring Program: Annual Mentoring Evaluation FORM (KU School of Medicine) *[partnership, personal growth, relationship; also includes an open-ended personal statement]*

#### Paired mentor/mentee evaluation of the mentoring relationship

* + Mentor and mentee evaluate mentor
		- [zip4] Paired Survey of Mentors-Mentees (Table 6.2, p. 144 in NASEM, 2019) *[mentor behaviors related to facilitating students’ research and career development and science identity]*
	+ Mentor and mentee self-assessment
		- [zip5] Mentee Role Self-Assessment and [zip6] Mentor Role Assessment (in Caddick, 2009) *[Parallel evaluation (mentor and mentee self-assess) of communication, trust, purpose, process, progress, feedback]*

#### Mentor/mentee evaluation of group dynamics

* [zip7] Instrument for evaluating dimensions of group dynamics (Appendix A in Schulz et al., 2003) *[Group dynamics characteristics (e.g., comfort level for expressing opinions, perceived level of trust) and intermediate measures of partnership effectiveness (sense of belonging to group, group empowerment)]*

### Open-ended questions

#### Mentee(s) evaluate mentor (individual or focus group)

* + [zip8] Key characteristics and suggested questions for five mentoring domains (Table 1 in Anderson et al., 2012) *[meetings and communication, expectations and feedback, career development, research support, psychosocial support]*

#### Mentor self-assessment

* + [zip9] How good a mentor are you? (Table on p. 797 in Lee et al., 2007**)** *[across 10 dimensions of good mentoring (e.g., appreciating individual differences, celebration, skill development]*
	+ [zip10]Mentor self-reflection template (Table 3 in Anderson et al., 2012 ) *[Mentor’s self-reflection on meeting and communication, expectation and feedback, career development, research support, psychosocial support]*

#### Mentor/mentee discussion

* + [zip11] Periodic Mentoring Partnership Review (in Caddick, 2009) *[guiding questions for mentor and mentee reflect on and discuss together]*
	+ [zip12]Evaluating Your Mentoring Relationship (Duke Human Resources) *[guiding questions for mentor and mentee to reflect on and discuss together]*

### Combination peer observation, focus group, open-ended survey

* [zip13] Draft protocol for peer evaluation of a research group (based on an observation done by Tim Curran in 2019) *[lab meeting observation + focus group + open-ended follow-up survey]*

## Resources for identifying and mitigating negative experiences

Note: the numbers in brackets preceding the resources (e.g., [zip14], [zip15]) 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].

[zip14] Handelsman, J., Pfund, C., Lauffer, S. M., & Pribbenow, C. M. (2005). Entering mentoring: A

seminar to train a new generation of scientists, p. 59-90. (web [link](https://www.hhmi.org/sites/default/files/Educational%20Materials/Lab%20Management/entering_mentoring.pdf)) *[Compilation of mentor training seminars to facilitate effective mentoring relationships in undergraduate trainee relationships]*

[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]*

[zip16] Straus, S. E., Johnson, M. O., Marquez, C., & Feldman, M. D. (2013). Characteristics of

successful and failed mentoring relationships: a qualitative study across two academic health centers. Academic medicine: journal of the Association of American Medical Colleges, 88(1), 82. <https://doi.org/10.1097/ACM.0b013e31827647a0> *[Characteristics of effective mentors and failed mentor relationships]*

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# Annotated Bibliography of Key References

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].

[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]*

[zip24] National Academies of Sciences, Engineering, and Medicine (NASEM) (2017). The role of mentoring. 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). Mentorship Behaviors and Education: How Can Effective Mentorship Develop? 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*](https://www.nap.edu/resource/25568/interactive/mentorship-defined.html)*]*

[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]*

[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]*

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New evidence based approaches. Clinical and Translational Science 5(1), 71-77. <https://doi.org/10.1111/j.1752-8062.2011.00361.x>.

[zip18] Berhe, A. A., & Kim, S. (2019). Avoiding racial bias in reference letters.

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Relationships Mentoring Workbook.

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[zip24] National Academies of Sciences, Engineering, and Medicine (NASEM) (2017). The role of mentoring. 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>

[zip25] National Academies of Sciences, Engineering, and Medicine (NASEM) (2019). Mentorship Behaviors and Education: How Can Effective Mentorship Develop? Chapter 5 in: The Science for Effective Mentorship in STEMM*.* National Academies Press (pp. 103-125). <https://doi.org/10.17226/25568> Interactive version: <https://www.nap.edu/resource/25568/interactive/mentorship-defined.html>

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[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](https://doi.org/10.1016/S0149-7189%2803%2900029-6)

[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.

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

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# Appendix: Additional Details On Effective Mentoring Practices

Additional details on effective mentoring practice[s](https://www.google.com/url?q=https://docs.google.com/document/d/1vijtggPpc_twpwEIgQdwY7FWZ7B6MaJt9XTicx1qb7Y/edit?usp%3Dsharing&sa=D&ust=1604969511183000&usg=AOvVaw2HlHQ-l8yiV-NikXr5jcpp) (see separate document)