

Future-Oriented, Asset-Based Advising to Address Disengagement Among Women in Mechanical Engineering

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Abstract

Low enrollment and retention of women in mechanical engineering persist despite decades of curricular reform and outreach initiatives. This paper presents a theory-grounded, future-oriented advising intervention that addresses early disengagement among undergraduate women in mechanical engineering. Drawing on research in possible selves, episodic future thinking, growth mindset, and asset-based frameworks, the intervention reframes disengagement as a motivational and identity-development challenge rather than a deficit in preparation or ability. The paper synthesizes motivational theory; describes a structured advisor–student intervention; analyzes advisor training for fidelity and equity; and presents an aligned assessment and reporting plan. Implications for engineering education and student success practice are discussed.

1 The Disengagement Problem

Mechanical engineering programs continue to struggle with the recruitment and retention of women, who remain significantly underrepresented relative to men. While academic preparation is sometimes assumed to be the primary driver of attrition among students in general, mounting evidence suggests that disengagement emerges early and reflects behavioral, psychological, and contextual factors rather than academic failure alone. Early indicators such as missed orientations, low involvement in academic or co-curricular communities, inconsistent attendance, and limited help-seeking behaviors signal risk long before students formally exit a program. These indicators point to a broader disengagement process marked by weakened sense of belonging, diminished motivation, and fragile professional identity.

Traditional institutional responses to disengagement frequently rely on deficit-oriented interpretations, framing students as underprepared, unmotivated, or lacking resilience. Such framings are particularly problematic for women in male-dominated fields, where stereotype threat and isolation can amplify self-doubt and discourage persistence even among academically capable students. Research on academic self-efficacy demonstrates that students’ beliefs about their ability to succeed are among the strongest predictors of persistence and performance in higher education (McMichael et al., 2022). These beliefs are shaped not only by prior achievement but also by how students interpret challenges and envision their future trajectories.

For women in mechanical engineering, disengagement often manifests as a gradual erosion of connection rather than overt academic failure. Students may attend class but avoid participation,

delay seeking support, or quietly question whether they belong in the field. These patterns align with research showing that disengagement frequently reflects motivational and identity-based processes that precede observable academic decline (Barnett et al., 2018). As a result, interventions triggered only after grades fall may arrive too late to prevent attrition.

The disengagement indicators used institutionally to recommend intervention are best understood as early warning signs of disrupted motivation, weakened future vividness, and threatened identity rather than as isolated compliance failures. Addressing these indicators requires an intervention approach that helps students reconnect present academic behaviors with personally meaningful future selves, normalizes difficulty as part of professional development, and affirms the assets students bring from their backgrounds and experiences. This reframing provides the foundation for the future-oriented advising intervention described in this paper.

2 Motivational Theory Foundation

The intervention is grounded in an integrative motivational framework drawing from possible selves theory, episodic future thinking, growth mindset research, and asset-based perspectives on student development. Together, this literature converges on a central insight: students are more likely to persist when they can vividly imagine a valued future self and perceive present challenges as meaningful steps toward that future rather than as evidence of misfit or failure.

Possible selves theory posits that individuals' images of who they might become, hope to become, or fear becoming serve as powerful motivators of behavior (Markus and Nurius, 1986). Possible selves alone do not sustain action. For motivation to translate into persistence, future selves must feel plausible, identity-congruent, and linked to concrete strategies (Oyserman et al., 2006). When these conditions are absent, students may disengage despite endorsing positive academic aspirations.

Episodic future thinking extends this framework by emphasizing the vividness and specificity with which individuals imagine future events. Longitudinal research demonstrates that students who vividly imagine their graduation and post-graduation lives develop stronger academic self-efficacy and are more likely to persist in STEM fields (McMichael et al., 2022). This research also reveals gendered patterns. While women often begin college with strong future vividness, their clarity about post-graduation life may stagnate or decline in male-dominated fields, undermining persistence.

Mental contrasting and implementation intentions provide a complementary mechanism for translating future-oriented motivation into action. Pairing positive future visualization with explicit planning for anticipated obstacles increases study time and goal achievement among university students (Clark et al., 2021). In contrast, unstructured positive fantasies without planning can reduce effort and performance, particularly among disadvantaged students (Kappes et al., 2011). These findings underscore the importance of integrating obstacle anticipation and strategic planning into future-oriented interventions.

Growth mindset and asset-based frameworks inform the intervention's interpretive stance.

Growth mindset research demonstrates that framing ability as developable encourages persistence in the face of challenge (Dweck, 2006). Asset-based perspectives, such as community cultural wealth, emphasize recognizing students’ existing strengths, experiences, and social resources rather than focusing on perceived deficits (Bañuelos, 2021). Together, these perspectives position disengagement as a solvable motivational and contextual challenge.

3 Intervention Structure

The intervention structure translates theory into practice through a structured, advisor-led conversation designed for students exhibiting disengagement indicators. The model unfolds over approximately 30 minutes and is organized into sequenced phases that progressively build future vividness, normalize challenge, and translate insight into action, as shown in Figure 1.

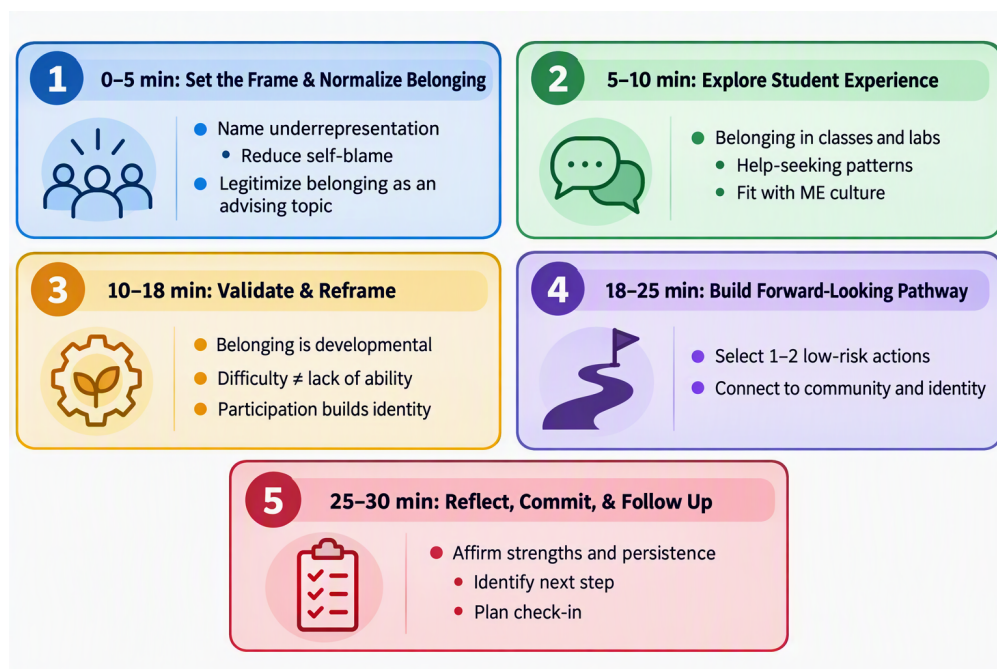


Figure 1: A theory-informed, future-oriented advising intervention designed to strengthen sense of belonging and professional identity among women in mechanical engineering.

The opening phase establishes a non-evaluative frame, signaling that the conversation centers on the student’s experience and aspirations rather than performance monitoring. This framing reduces defensiveness and fosters psychological safety, particularly for women who may already feel scrutinized in male-dominated environments. The advisor then guides the student through a future self-visualization exercise developed by the author and adapted from a brief visioning protocol. The student imagines a near-future moment in which academic life is going reasonably well, directly targeting future vividness, a key predictor of academic self-efficacy (McMichael et al., 2022).

The second phase focuses on obstacle identification and normalization. Rather than treating barriers as signs of inadequacy, the advisor reframes difficulty as expected and meaningful. This

approach draws on identity-based motivation research showing that students persist when difficulty is interpreted as normative for people like them (Oyserman et al., 2006). For women in mechanical engineering, this step counteracts internalized narratives of misfit.

The third phase translates future orientation into concrete action through implementation intentions. Using if-then planning, the advisor helps the student link anticipated challenges to specific, low-barrier behaviors. This approach increases academic engagement and study time (Clark et al., 2021). Actions are co-constructed to align with the student’s identity, values, and existing commitments.

The intervention concludes with reflection and follow-up planning, reinforcing the student’s agency and competence. By connecting present actions to a valued future self, the structure integrates future vividness, self-efficacy, and identity congruence into a coherent motivational experience.

4 Advisor Training Plan

Effective implementation depends on advisor preparation that extends beyond procedural familiarity to include theoretical understanding and equity-oriented practice. The advisor training plan supports fidelity, consistency, and alignment with asset-based, growth-oriented advising principles.

Training begins with an overview of the motivational theories underlying the intervention, including possible selves, future vividness, and implementation intentions. Advisors are encouraged to understand why each component matters, enabling adaptive yet theory-consistent implementation (Oyserman et al., 2006).

A central component of training involves practicing visioning and reframing techniques through role-play exercises. Advisors develop skills in reflective listening, identity-affirming language, and normalization of difficulty. These practices help avoid deficit-based interpretations and support students’ sense of belonging and competence.

The training explicitly addresses gender dynamics in engineering contexts. Advisors are prepared to name structural underrepresentation without reinforcing stereotypes, helping students externalize challenges rather than internalize blame (Bañuelos, 2021).

The training plan also includes guidance on documentation, follow-up, and referral pathways to integrate the intervention with broader advising systems.

5 Assessment Plan With Success Metrics

The assessment plan evaluates effectiveness in addressing disengagement indicators and supporting persistence. Rather than relying on distal outcomes such as graduation, the plan emphasizes intermediate motivational and behavioral measures aligned with the intervention’s theoretical targets.

Primary success metrics include changes in engagement behaviors such as attendance consistency, involvement in academic or co-curricular activities, and timely help-seeking (Barnett et al.,

2018). Where available, changes in academic self-efficacy and sense of belonging are assessed using validated instruments.

The design incorporates pre- and post-intervention comparisons and longitudinal tracking to examine sustained effects. Qualitative reflections collected during advising sessions provide insight into students’ meaning-making and identity development (Oyserman et al., 2006).

Reports emphasize transparency and utility for advisors, department leaders, and institutional decision-makers. Findings are aggregated to highlight systemic patterns rather than individual deficits.

6 Conclusion

This paper presents a future-oriented, asset-based advising intervention that addresses early disengagement among women in mechanical engineering. By integrating motivational theory with structured advising practice, the intervention reframes disengagement as a solvable challenge rooted in future vividness, identity, and self-efficacy. The model demonstrates how brief, theory-informed conversations can meaningfully support persistence and equity in engineering education.

References

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