

The Rising Doctoral Institute: Empowering Minority Students to Thrive in Engineering Ph.D. Programs

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Persistent disparities in retention, time-to-degree, and sense of belonging for racially and ethnically underrepresented minoritized (URM) students in engineering doctoral programs remain a critical challenge in graduate engineering education [1], [2]. National data consistently show that URM students complete engineering Ph.D.s at lower rates and over longer timeframes than their majority peers, reflecting not differences in preparation or ability, but structural and cultural misalignments within doctoral education [2]. Prior research suggests that the transition into doctoral study represents a particularly consequential period, during which students encounter a sharp increase in ambiguity, autonomy, and responsibility, often without explicit guidance on how to navigate these expectations [3]. This early doctoral transition is frequently characterized by exposure to the "hidden curriculum" of graduate education, the unwritten norms, expectations, and power dynamics that shape success but are rarely made explicit to newcomers [4], [5]. When students lack access to this tacit knowledge, they may struggle to interpret advisor expectations, manage research uncertainty, or make strategic decisions about coursework, funding, and professional development [4], [5], [6]. These challenges are especially pronounced for URM students, who are more likely to enter doctoral programs without informal networks that provide advanced knowledge of how doctoral systems operate [7], [8].

The Rising Doctoral Institute (RDI) was developed to directly address these transitional challenges by supporting URM engineering doctoral students before and during their entry into Ph.D. programs, with recent work explicitly framing the institute as a site for developing doctoral agency rather than solely transmitting information [9]. The RDI is intentionally designed as an agentic intervention that equips students with strategies, language, and social support to engage actively with doctoral systems [9]. This extended abstract summarizes the design of the RDI, its multi-institutional expansion, and emerging findings from a longitudinal mixed-methods study, including newly incorporated alumni interviews that provide insight into longer-term developmental outcomes.

Launched in 2019, the Rising Doctoral Institute is a structured workshop experience offered to incoming engineering doctoral students who self-identify as racially or ethnically underrepresented [10]. The institute is typically delivered before the start of the fall semester, positioning it as a preparatory yet developmental space that bridges undergraduate or professional experiences with doctoral expectations [10]. The RDI curriculum was informed by prior research on graduate student socialization and by empirical studies examining the experiences of advanced URM doctoral students [4], [6], [7], [8], [11]. These studies identified critical gaps in early doctoral preparation, particularly in navigating advisor relationships [6], [11], understanding funding structures [1], managing time and productivity [12], and setting realistic expectations for research progress [5], [8]. In response, RDI modules explicitly address:

1) Navigating advisor–advisee relationships and communication norms, 2) Understanding dissertation committee formation and expectations, 3) Managing research funding, assistantships, and institutional resources, 4) Approaches to time management and productivity under conditions of ambiguity, and 5) Building peer networks and community across institutions. A central design principle of RDI is normalization: participants are encouraged to view uncertainty, confusion, and early struggle not as personal deficiencies, but as expected features of doctoral education. Through facilitated discussions and peer interaction, the institute aims to reframe doctoral success as an ongoing process of learning how to act within complex academic systems.

The project employs a longitudinal mixed-methods research design, consistent with prior evaluations of doctoral preparation interventions, to evaluate the RDI and study URM students' doctoral transitions [10], [12], [13], [14]. Data collection includes pre- and post-institute surveys, focus groups, and semi-structured interviews conducted throughout participants' first year of doctoral study. These instruments are designed not only to capture outcomes but also to examine how students make sense of and respond to doctoral environments over time. In recent iterations of the project, data collection has been expanded to include interviews with RDI alumni, responding to calls for longitudinal examinations of doctoral socialization, persistence, and agency development across the Ph.D. trajectory [4], [15], [16]. These alumni interviews provide a longer-term perspective on how early RDI experiences shape students' approaches to doctoral study beyond the first year. Alumni are invited to reflect on how RDI influenced their navigation of research uncertainty, their relationships with advisors, their help-seeking behaviors, and their sense of agency as doctoral scholars. This addition responds directly to calls within engineering education research to move beyond short-term program evaluation and toward understanding developmental and transferable outcomes. Across institutions, participants who completed the RDI are also invited to engage in periodic individual interviews and, in some cases, monthly focus groups during their first year. These spaces serve as both research sites and supportive environments where students can articulate challenges, share strategies, and collectively interpret their experiences in doctoral programs.

Following successful implementations in 2019 and 2021, the RDI model was intentionally scaled for adoption at multiple institutions across the United States beginning in 2022 [10], with subsequent work documenting institution-level adaptation and implementation processes through detailed case study analysis [17]. Partner institutions included a mix of land-grant universities, minority-serving institutions, and large research-intensive universities [10], [17]. The RDI team mentored local organizers to adapt the model while maintaining core principles related to content, timing, and student-centered facilitation [10], [17]. Some institutions implemented the RDI as an intensive multi-day workshop prior to the semester [17]. In contrast, others distributed sessions across the fall term to better align with local contexts and student availability [10], [17]. In all cases, institutional leaders are committed to collecting research data in collaboration with the RDI team, enabling comparative analysis across implementation models. Monthly interviews

with students at partner institutions further allow the research team to examine how institutional context shapes the effectiveness of early doctoral interventions [17].

Preliminary findings suggest that the RDI plays a meaningful role in supporting URM students' early doctoral transitions by fostering agency, normalization, and strategic engagement, aligning with prior research on graduate student socialization, expectancy–value dynamics, and students' navigation of complex engineering systems [4], [8]. Participants frequently describe entering their programs with greater clarity about expectations and increased confidence in navigating uncertainty [9]. Alumni interviews further indicate that RDI's impact extends beyond the first year, echoing prior work that conceptualizes RDI as an early site of agentic practice whose effects unfold over time. Alumni describe drawing on strategies introduced during the institute, such as proactive communication with advisors, intentional peer support, and reframing ambiguity as inherent to research, when encountering later doctoral milestones. These findings suggest that what students gain from RDI is not limited to discrete skills or information, but includes transferable ways of thinking and acting within research environments.

This work contributes to engineering education research by positioning doctoral transition support as a developmental and agentic process rather than a remedial one. The RDI offers a replicable model for institutions seeking to improve equity in doctoral education by foregrounding the hidden curriculum and explicitly teaching strategies for engaging with doctoral systems. Future work will continue to analyze longitudinal and alumni data to better understand how early interventions shape doctoral persistence, identity development, and time-to-degree. The RDI team also plans to expand institutional partnerships further and to study how variations in implementation influence student experiences. Together, these efforts aim to strengthen pathways into and through engineering doctoral programs by recognizing and supporting students' capacity to act within complex academic systems.

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