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Cultivating Entrepreneurial Innovation: NSF I-Corps Training for Engineering Education Researchers

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Title

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Abstract

Engineering education research (EER) training prepares graduate students and postdocs to be successful in academic careers. However, the research skills developed through EER readily transfer into other promising, but underexplored, professional opportunities, including entrepreneurship. The reality of the current research funding climate led us to reevaluate our existing support systems and consider alternative possibilities. After exploring and brainstorming, we decided to apply to the NSF-supported regional Innovation Corps (NSF I-Corps). The NSF I-Corps offers an experiential learning experience for researchers interested in translating their intellectual property and technical innovation into a viable commercial product. Through the customer discovery process, we interviewed over 30 stakeholders and iteratively refined our value proposition and understanding of the market for our technical innovation. By the end of the program, these interviews, coupled with feedback from the program mentors, were instrumental in shifting our perspective towards a more entrepreneurial mindset.

In this paper, we reflect on our preparation and participation in the NSF I-Corps as a team of engineering education researchers. Our team had varying levels of prior exposure to entrepreneurship before participating in the program. In addition to our key takeaways, we discuss some overlapping competencies between EER and entrepreneurship, based on our experience with the NSF I-Corps. These include conducting evidence-based research, leveraging personal and professional networks, and pitching ideas to different stakeholders. Finally, by sharing our experience, we hope to encourage more engineering education researchers to develop entrepreneurial competencies and participate in startup incubation opportunities like the NSF I-Corps program.

1. Introduction

The rapid advancement of artificial intelligence (AI) technologies has created unprecedented opportunities for innovation in educational technology (EdTech) [1], particularly when these innovations are grounded in pedagogical research and learning sciences. While considerable investments have been made [2], there remains substantial room for growth in developing EdTech that are informed by educational expertise. Current EdTech developers, though technically skilled, often have limited exposure to learning sciences and pedagogical frameworks [3], and may not yet fully engage with the insights of key educational stakeholders—particularly teachers and education researchers who understand the nuances of classroom contexts [3], [4], [5]. This presents a valuable opportunity: bridging the gap between technological capability and educational expertise could yield systems that are both technically sophisticated and pedagogically transformative.

Education researchers are uniquely positioned to lead this charge. However, realizing this potential requires addressing current resource constraints. Current funding pressures across educational institutions [6], [7] affect not only career pathways for education researchers but also the capacity to develop and scale research-informed EdTech. Meanwhile, the rapid growth of generative AI startups in education [8] underscores the urgency of this opportunity—the field would benefit tremendously from education researchers actively participating in the design, development, and commercialization of educational technologies. By embracing entrepreneurial roles, education researchers can help ensure that EdTech realizes its promise for authentic pedagogical transformation [9], [10], creating a future where technological innovation and educational research advance in tandem.

This opportunity is particularly salient for engineering education research (EER) teams, who stand at a unique intersection of technical knowledge and pedagogical expertise. In traditional engineering disciplines, developing intellectual property, filing patents, and pursuing commercialization pathways are becoming increasingly more established as norms of academic practice [11], [12]. Engineering educators, however, have not typically engaged with these entrepreneurial practices to the same degree. As the field evolves and EER increasingly develops EdTech, research outputs are expanding beyond scholarly publications to include tangible products with potential commercial applications. This shift brings new considerations that have not traditionally been part of EER culture, including questions of intellectual property (IP) ownership, protection, and licensing. What IP protection looks like for EER may well differ from discipline-based engineering pursuits of commercialization, and engaging with these questions becomes increasingly important as the field produces more technology-based innovations.

To explore what entrepreneurship and commercialization might look like for engineering education researchers, our team participated in the National Science Foundation Innovation Corps (NSF I-Corps) program [13]. This program is a training initiative that helps researchers evaluate the commercial potential of their innovations through structured customer discovery and business model development. As researchers, trained as engineers, who now work in engineering education, we occupy a unique position to reflect on educational technology development and consider what engineering education researchers can uniquely leverage and contribute to the broader education community. In this paper, we share our experience navigating this process to encourage broader dialogue within the education community about research translation, IP considerations, and entrepreneurial pathways for educational innovations.

2. Engineering Education Research and Entrepreneurship: Overlapping Competencies

The Kern Entrepreneurial Engineering Network (KEEN) framework offers a valuable lens for understanding how EER can develop entrepreneurial competencies [14], [15]. KEEN defines the entrepreneurial mindset through three core pillars: *curiosity* (investigating a rapidly changing world with insatiable curiosity), *connections* (integrating knowledge to reveal innovative solutions), and *creating value* (persistently anticipating and meeting the needs of a changing world) [16]. These principles, originally designed to cultivate entrepreneurial thinking in undergraduate engineering students, resonate deeply with the work engineering education researchers already do (Table 1). EER routinely exercise curiosity by investigating engineering teaching, learning, and practice; make connections by synthesizing educational theory with engineering practice; and create value by developing pedagogical innovations that improve educational outcomes.

It is important to note that EER and entrepreneurship are not the same activity. They serve different purposes and operate under different constraints. But the competencies developed through research practice can transfer to entrepreneurial contexts when researchers choose to pursue commercialization. Programs like NSF I-Corps provide structured environments for making this transfer explicit. Engineering education researchers already know how to investigate stakeholder needs through rigorous inquiry; I-Corps channels that same investigative capacity toward customer discovery and market problems. By participating in entrepreneurship training, EER can leverage their existing KEEN-aligned competencies while developing new skills in business model development, market analysis, and intellectual property navigation that are essential for successful technology commercialization.

Table 1. KEEN Framework applied to EERs and Entrepreneurship.

KEEN Principle	Transferable Competency	In EER Research	In Entrepreneurship
Curiosity	Systematic investigation of problems and opportunities	• Identifying research gaps • Investigating learning phenomena • Exploring new pedagogical approaches	• Customer discovery • Market research • Problem identification
Connections	Synthesizing diverse knowledge into coherent frameworks	• Linking theory to practice • Synthesizing across literature • Integrating educational frameworks	• Connecting customer needs to solutions • Building on existing technologies • Identifying market opportunities
Creating Value	Developing solutions that address stakeholder needs	• Developing pedagogical innovations • Improving student outcomes • Disseminating findings to practitioners	• Product development • Demonstrating product-market fit • Scaling solutions

3. From Disruption to Discovery: Our Entrepreneurial Journey

3.1 Navigating Tumultuous Times

In early 2025, the EER community, like many other research communities across the U.S. [6], [7] was impacted by the termination of NIH and NSF funded research grants. At the time, we were constantly confronted with negative projections of the fate of academic research and higher education: the uncertainty about current and future funding opportunities for academic research and concern for our colleagues and members of our community who were directly affected. We decided to diversify our EER portfolio by considering alternative funding opportunities outside the traditional mechanisms available to the EER community.

First, we identified new research directions that were most aligned with our collective research expertise. We asked ourselves: who else in the broader engineering and education ecosystem would be interested in the outcomes of our research? What problems were we uniquely positioned to solve? This process was crucial in considering the audience beyond the immediate EER community to consider other members of the engineering ecosystem that would also be interested in the final “products” of EER research. In the ideation stage, we brainstormed potential ideas and collectively consolidated them where we saw potential overlap. Through this process, we identified three strong ideas. For each, we then developed an elevator pitch and made a case for how our team was best suited to pursue it.

One idea stood out: an AI-based educational technology that drew directly on our research expertise. We had a clear concept of how it would function and a longer-term development roadmap, but did not yet have a minimum viable product. This approach was intentional. Before investing significant time and resources into development, we wanted to validate a critical question: did our proposed solution address an urgent problem for stakeholders?

3.2 Participating in the NSF I-Corps

A few of us had participated in the I-Corps program during graduate school, though not for education research purposes. We remembered the program's emphasis on customer discovery—systematically interviewing potential users, beneficiaries, and payers to understand their needs, pain points, and existing solutions. This seemed like exactly what we needed: a structured process to validate our concept before committing to full development. The NSF I-Corps program supports academic researchers interested in converting technological innovation developed in the lab into commercially viable products and services [13]. We applied to the regional program with our AI-based educational technology concept.

By participating in the month-long, regional course we learned about the customer discovery methodology, received feedback from our mentors to refine our value proposition and understanding of the market for our EdTech concept, and conducted over 30 interviews with potential stakeholders and customers. The customer discovery process focuses on understanding the experience, pain points, and habits of customers and other stakeholders [13]. As a result, we were able to learn more about the nature of the problems that our potential customers and stakeholders faced and how our proposed solution can be integrated into existing systems to create commercial value.

As EERs, we quickly recognized how the customer discovery process mirrored the qualitative methodologies we already employed in our research. The structured interviewing, iterative refinement based on feedback, and evidence-based exploration felt familiar. What differed was the analytical endpoint. Rather than generating knowledge claims for peer-reviewed publication, the objective centered on evaluating commercial viability—whether the innovation addressed problems that potential customers considered significant enough to warrant investment. Qualitative research expertise proved directly applicable. The capacity to design effective interview protocols, the ability to probe responses for deeper understanding, and experience synthesizing findings across heterogeneous stakeholder groups all translated into customer discovery work. In this sense, methodological training in education research functioned as an unanticipated asset in navigating the entrepreneurial process.

4. Reflection on Experience

4.1 Entrepreneurial Mindset

The journey from the funding crisis to customer discovery to diversified funding strategy illustrates a significant shift in how we think about our work as EERs. This experience challenged us to consider not just what we could study, but what we could build (*curiosity*), who would use it (*connections*), and how we could sustain its development (*creating value*). Thinking beyond traditional academic boundaries, we engaged in the customer discovery process and conducted market research to gain a real-world understanding of the problems and the systems in which they exist. We also learned to articulate the commercial impact of our innovation, identify target customers, and distinguish between users, beneficiaries, and payers. This required us to examine the broader ecosystem surrounding our technology including its potential applications, constraints, and opportunities to adapt and iterate. Thus, we were able to connect the customer needs and market opportunities to our proposed solution.

Engaging in rapid-cycle interviews pushed us to move past our immediate networks and connect with unfamiliar communities. This process broadened our perspective on who might benefit from our work and how different stakeholders conceptualize value. It also required us to communicate our ideas clearly and concisely to audiences with varying levels of familiarity with engineering education. Through this, we gained confidence in positioning our work in commercial, translational, and interdisciplinary contexts.

The program also encouraged us to consider alternative career pathways and the potential for EER innovations to have commercial or societal impact. By stepping outside our immediate disciplinary landscape, we began to see how educational technologies and research-based interventions might contribute to broader systems.

4.2 Impact on Research Trajectory

The I-Corps program had a direct influence on both our project and our broader research agendas. Entering the program with an early-stage prototype, we sought to understand whether a genuine market need existed. Through iterative refinement and stakeholder engagement, we gained clarity on the problem we were addressing and the conditions necessary for meaningful uptake. A key takeaway was that innovation must solve real problems for real people and integrate seamlessly into existing systems to be viable.

The insights we gained through these experiences directly strengthened our ability to pursue a wide range of research funding opportunities. Each opportunity required us to adapt our framing, refine our messaging, and tailor our communication to distinct audiences, core skills for any postdoctoral researcher preparing for a faculty career. This process also provided hands-on experience in grant writing, specifically, drafting, revising, and iterating proposals under different constraints and expectations. These cycles of development helped us practice articulating research significance, identifying urgent gaps, and crafting coherent and compelling research objectives, while the entrepreneurial training *(*i.e., curiosity, connections, and creating value*)* emphasized understanding stakeholder needs, clarifying value propositions, and aligning our work within broader systems. Collectively, these opportunities expanded our capacity to navigate diverse funding landscapes, strengthened our ability to reliably produce and refine grant narratives, and broadened our professional network for future collaborations, letters of support, and continued refinement of our research vision.

Ultimately, the program reshaped how we think about research, innovation, and the role of EER in addressing complex educational challenges. It refined our methodological toolkit, deepened our understanding of stakeholder ecosystems, and reinforced the importance of designing solutions that are both evidence-based and contextually grounded across multiple users.

4.3 Professional Growth

Participating in the local NSF I-Corps program provided our team with a deeply authentic professional development experience. As educational researchers, we often navigate institutional spaces where structured support is uneven or limited especially for postdoctoral researchers [17], [18]. The program introduced us to a broader ecosystem of internal, external, and regional resources that we had not previously accessed. This exposure helped us better understand the landscape of support available to early-career researchers and encouraged us to seek out additional, non-traditional opportunities for growth.

The program also highlighted the strengths we bring as EER researchers. Our training in qualitative methodologies (e.g., interviewing, protocol development, theoretical framing, and hypothesis-driven exploration) translated directly into customer discovery and market research. These skills allowed us to collect meaningful data efficiently and positioned us as methodological leaders among the participating teams. Engaging with diverse stakeholders expanded our professional networks beyond academia, connecting us with individuals invested in engineering student development, workforce readiness, and educational innovation. These new relationships have already informed ongoing collaborations and tangential research projects.

5. Recommendations

We encourage EER researchers to explore entrepreneurship training programs like I-Corps, university innovation centers, and startup incubators. These programs provide structured environments to translate research skills into business capabilities while offering access to mentors, networks, and resources often unavailable through traditional academic channels. For researchers developing educational technologies, particularly AI-enabled tools, engaging with these programs allows for crucial market validation and stakeholder feedback necessary to guide IP strategy and commercial viability assessment.

Entrepreneurship in education research does not necessarily mean launching startups. It can mean consulting partnerships, industry collaborations, licensing educational technologies, or pursuing non-traditional funding mechanisms. As the EdTech landscape evolves rapidly, particularly with AI integration, education researchers have a tremendous opportunity to actively participate in shaping these innovations. By bringing pedagogical expertise to technology development, EER researchers can help ensure that tools serve learning goals rather than just demonstrating what's technically possible. We also encourage researchers to engage early with questions of intellectual property protection for their innovations, to seek out diverse funding portfolios beyond traditional federal grants, and to build networks that extend beyond academia into EdTech development, policy, and practice communities.

6. Conclusions

The funding disruptions of 2025 forced us to reconsider how we could sustain and leverage our expertise, but they also revealed an opportunity that was always there: engineering education researchers are uniquely positioned to bridge the gap between educational expertise and technological innovation. Our participation in NSF I-Corps with an AI-based educational technology provided structure for exploring what commercialization might look like in this context. The program helped develop entrepreneurial competencies distinct from research skills, particularly around market validation, IP strategy, and business model development. We share this experience not as a prescriptive model but to open dialogue in the engineering education research community about pathways for translating research innovations into educational technologies. As AI tools continue to proliferate in educational settings, there is value in having researchers who understand pedagogy actively involved in shaping how these technologies are designed and deployed.

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