

# Barriers to Entrepreneurship for Women Neuroscientists

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**Overview:** Entrepreneurship guidance emphasizes the nuts and bolts or the “How” aspect of pursuing a commercial enterprise – most programs presume interest, confidence, and enthusiasm. In contrast, we are investigating and developing tools emphasizing the “Why” aspect of business pursuit. We seek to enhance the activity and entrepreneurial potential of women, specifically women life scientists. Development and assessment of an interactive simulation is identifying the key strategies to break down barriers and enhance entrepreneurship intent and efficacy for women in the life sciences.

**Problem:** Men dominate the commercialization of life science research, establish most life science businesses and receive the bulk of the investment capital. Although women receive most science PhDs and hold 47% of the research positions, they head only 12% of biostartups. In healthcare, women and women of color represent 67% and 22% respectively of entry-level jobs. Yet in the C-suite, the comparable numbers of women are dramatically lower: 29 and 5%. This is not simply an equity issue; this is a more broad poor allocation of valuable human capital. High barriers to entry plus the assumption of intent and confidence limit the pool of potential entrepreneurs to highly motivated individuals, often with an emphasis on high capital reward; this ignores more subtle motivating factors that can equally drive entrepreneurship such as societal impact.

**Goal:** Via iterative development and end-user testing we are creating an interactive simulation for life scientists that builds entrepreneurial self-efficacy and, if desired, entrepreneurial intent. Life scientists can bring their pre-existing skills and talents in science and proposal creation to a process that helps them evaluate the appeal of entrepreneurship, assess their entrepreneurial intent, encounter common challenges associated with pursuing a business idea, explore solutions to overcome these challenges and barriers and develop a plan to move forward with enhanced confidence.

**Background:** NIH invested \$42.9 billion in 2021 and over 56,000 research grants. Translating that activity and the revolutionary changes in the field of brain research requires entrepreneurial activity by life scientists. However, there is a lack of female life science entrepreneurs. Successful commercialization of the NIH research requires that entrepreneurial activity draws from the complete pool of skilled individuals including women and others who may not have the instinct to form a business enterprise but most certainly have or can obtain entrepreneurial skills and capability. In our initial work, we engage consultants and women in life sciences including entrepreneurs, and learned that low entrepreneurial intent and self-efficacy in women are driven by:

- Individual factors. In our initial work with 31 women at all stages of life science careers, 71% identified low confidence in entrepreneurial ability as a significant barrier. They also doubt their business communication skills.
- Training bias: Few resources help an individual uncover entrepreneurial potential. Current entrepreneurship training typically assumes entrepreneurial intent and efficacy and instead focuses on the nuts of bolts of building a business plan and seeking capital.
- Passive resources: They assume enthusiasm and drive exist and emphasize knowledge creation or task completion rather than exploratory and interactive processes that can engage potential entrepreneurs.

- Ignorance of unique pre-existing strengths: Especially relevant to the life scientist equipped with significant science and proposal-building skills and talents. Life scientists are uniquely qualified to create businesses that can develop and market a tool or substance that adds value to the health or life science community.
- Lack of role models. Mentorship fuels entrepreneurial intent and confidence. Women want examples and guidance, especially from other women. Insufficient role models, business peers, and example cases of success harm intent and perpetuate the impression that success is limited to a certain type of individual. In fact, as business evolves to a more collaborative, less “top-down” hierarchical structure, the collaborative skills of women, in general, may be more appropriate than the past images of the typical business firm driven by a powerful CEO and tightly managed.

**Intervention Strategy:** Our intent is to complement standard approaches such as informational resources, MBA training, and startup incubators. Iterative development and end-user testing of computer-based simulations with 3D images are emphasizing exploration and targeting skills development that translates to “real life” action. We offer interactions with 3D characters where users can try different approaches including potentially unfamiliar ones or strategies that they would not typically deploy such as asking directly for mentorship from a senior and successful women entrepreneur. Computer simulation is a cost-effective and scalable solution vs. in-person training and provides training organizations with repeatable and consistent learning encounter that takes advantage of the acceptance and familiarity with gaming environments. In addition to the interactive simulation, we developed a multi-modal interactive digital toolkit, a set of self-assessment tools, and a collection of interactive web-based education modules.

**Results:** Respondents' top interest included fictional narratives highlighting women’s successes in life science firms and real-life examples of successful mentorship and entrepreneurship. They identified stories in the 3rd person, 1st person interviews, and example focus groups – each followed by key points, tips, and take-home messages. Secondly, to enhance barrier-breaking skills development they wanted an interactive branching path narrative with decision points and customized immediate feedback. Finally, they wanted to assess their readiness for business in terms of their intent and self-efficacy in the form of “Are you ready?” interactive quizzes. Current work is testing the impact of linear narratives on established scales of entrepreneurial intent and self-efficacy, customized for an audience of life scientists and its unique challenges. Results are guiding interactive dialog elements including branching path experience and self-query tools.

**Discussion:** The needs and desires of women life scientists are unmet by the existing resources. Our work thus far has identified numerous deficiencies in the current approach to facilitating entrepreneurship in women life scientists. They want guidance emphasizing early-stage entrepreneurial investigation. They seek experiences that will develop skills and build confidence. They want to understand the barriers to entrepreneurship, be they internal or external, and explore the most efficient strategy to overcome barriers to entrepreneurship. In short, the number of missing elements is vast. The potential utility and the complexity of delivering a solution for each desire are unclear. Our early efforts are prioritizing and sequencing the delivery of a subset of the vast potential of approaches, then seeking input regarding their perceived benefit. They respond favorably to a brief, multi-modal interactive digital intervention as a cost and time-efficient way to deliver such a solution. As the product is not finalized, we do not have evidence that our intervention can build intent from curiosity and potential interest. Nor have we established that the strategy can expand pre-existing confidence in life science and academic pursuits into the field of entrepreneurship.

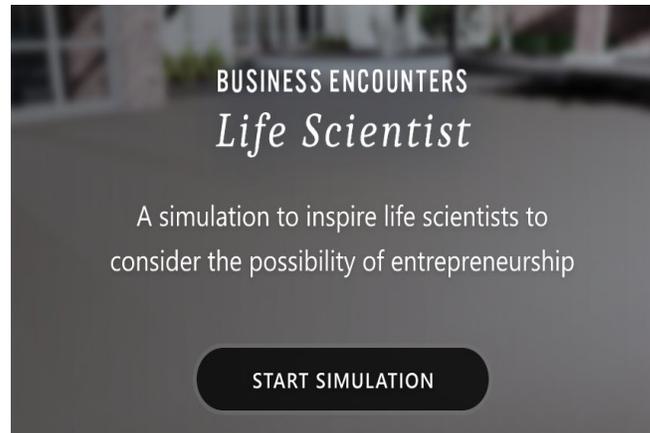
**Implication:** Broadening the pool of potential entrepreneurs is a worthwhile goal. There is an audience that can be engaged and wants to be engaged in a discussion of the potential of entrepreneurship. For each audience, there are likely different baseline skills and enthusiasm, and the solution should be tuned to meet their unique capability and concerns. Organizational change is necessary to accept the weaknesses of the current strategy and to break down barriers that are not under individual control.

For society to fully benefit from life science research there must be several paths to building a commercial enterprise. The NIH SBIR program is one alternative path, but even here existing biases assume pre-existing enthusiasm, intent, and confidence. Further, this approach expects a large investment of time and energy in a one-dimensional process. This is in stark contrast to the support for investigators that are available through the numerous types and structures available via NIH research awards. Nonetheless, for many potential life scientists, especially women, the SBIR program represents the most logical next step once intent and confidence have been established.

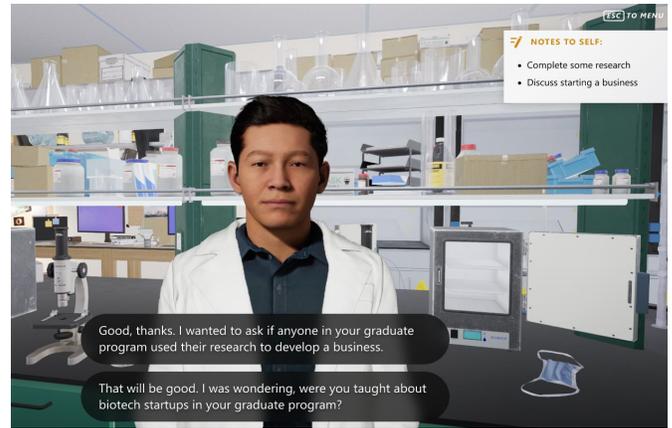
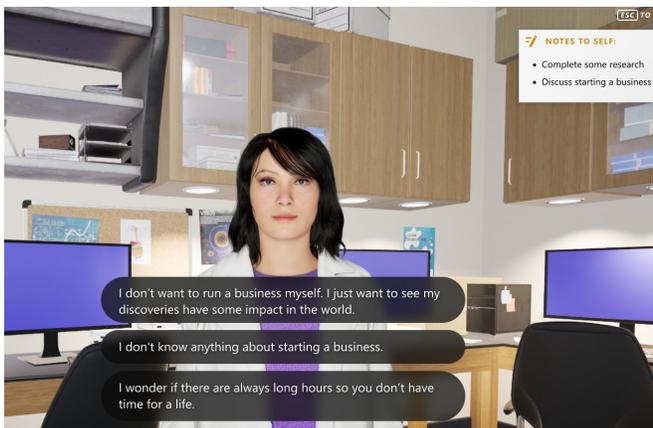
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## Simulation Screenshots



Experience highlights strategies to network with peers to investigate intent and identify common barriers and how they were overcome.



Experience highlights strategies to network with potential mentors and assistants

