

BUSINESS ENCOUNTERS: LIFE SCIENTIST

WHY IT WORKS

PROBLEM

In 2019, the NIH invested \$26 billion in 49,000 research grants¹. One goal of NIH's 2016-2020 strategic plan is to “*fuel the U.S. biomedical industry and keep our nation globally competitive*”². To maximize return on this investment^{3,4}, the NIH needs a robust system to transform health science innovation into commercial products⁵. Success depends on life scientists; they establish most biomedical start-ups⁶.

However, there is a lack of female life science entrepreneurs⁷. Although, women receive around half of the PhDs in the life sciences and hold around 47% of the research positions, they head only 12% of the biostartups⁸. Life scientists typically lack essential business skills^{9,10}; however women suffer from additional barriers¹¹⁻¹⁵. Women have lower self-efficacy and intention to initiate a business venture¹⁶⁻²⁰. Successful entrepreneurship requires confidence to overcome barriers and skills to avoid common mistakes²¹.

SPECIFIC CHALLENGES FOR WOMEN ENTREPRENEURS

Funding Bias: On average, women entrepreneurs get less funding than men^{22,23}, receiving 2 to 3% of VC investment capital^{24,25}. For perspective, in 2016, \$64.9 billion went into male-founded start-ups and only \$1.5 billion to female-founded start-ups²⁶. The low figure is partially due to smaller deals for women²⁷.

Possible explanations for fewer women entrepreneurs include the male-dominated network of venture capital and the low percentage of female partners²⁸, as well as conscious or unconscious bias of investors^{22,23}. Low entrepreneurial self-



efficacy in women also plays a role^{9,13} and has been targeted for improvement by the likes of Melinda Gates²⁹ and some VCs³⁰. However, at least some of the lower self-efficacy reflects real differences in how women are treated in academia and industry. For example, less support for women in academia result in fewer credentials that might attract venture capitalists, such as honors and leadership positions^{22,23}.

Known barriers to funding from venture capital and inherent biases in businesses, especially technology³¹, will continue to exist. Yet, if successful, the programs in place to support entrepreneurship can draw from a more representative pool of skilled individuals by including more women.

- **Few Role Models:** Female role models guide women to see potential value in entrepreneurship; however, the number of possible models is low¹⁴.
- **Male-Oriented Identity Perceptions:** Others postulate that because the definition of an entrepreneur follows male identity standards, it may conflict with women's perceived identity³². High-growth businesses, including biotechnology, are often in male-dominated industries³³, resulting in a masculine stereotype being associated with these businesses, one that is incongruent with traditional female gender identity.
- **Typically Male Traits:** Business often values typically masculine traits over typically feminine traits in the and suggests learning skills manifesting these traits and practicing typical entrepreneur-defined achievement strategies, at least in the short-term, improves a woman's acceptance and success²³.

HOW BUSINESS ENCOUNTERS: LIFE SCIENTIST CAN HELP

Our simulation uniquely helps graduate students, post-docs, and early-stage life scientists with a minimal level of entrepreneurial self-awareness, interest, efficacy (confidence), or intention explore factors that impact entrepreneurial intent and self-efficacy. If successful, we will broaden and diversify the human capital resources available to move life science research "from bench to bedside" by enlarging the pool of women with the entrepreneurial intent and self-efficacy to pursue commercialization. We emphasize:

- **Assessment and (If Desired) Enhancement of Women's Entrepreneurial Intent:** Entrepreneurial intention refers to having the desire and making the plans and strategies for starting a potentially successful entrepreneurial venture³⁴. Intention connects ideas and attitude with behaviors. Intention is also impacted by perceived or actual readiness.
- **Women Role Models:** By showing women achieving entrepreneurship in our simulation and by celebrating real-life success stories on our website, our interactive experiences can help address this barrier. The interactions can also depict ways real-life women have successfully managed barriers often blamed for the gender differences in entrepreneurship, such as family obligation inequalities³⁵.
- **Female-Oriented Identity Perceptions:** A solution to this explanation achievable through training includes changing one's internalized concepts of entrepreneur and/or developing skills in traits one might not have.
- **Broader Personality Traits:** Our simulation can highlight the value of skills that are often identified as masculine (projecting confidence, assertive communication, managing situations to one's advantage, and negotiation skills) as well as skills that are often identified as feminine (finding common ground, prioritizing and highlighting key points, pursuing win-win approaches, valuing "making a difference", and effective use of emotionality and social connection)^{36,37}. Pursuing both does not require sacrificing women's strengths.

- **Business is Not Always the Right Choice:** We do not presume that a business career is the right choice for every woman. Instead, our simulation experience helps women life scientists at various stages in their career, explore the advantages, barriers, and challenges of an entrepreneurial career through a variety of scenarios/cases outlined below. Women can then decide if they want to take advantage of the powerful entrepreneurship support of university, SBIR, NIH, and state resources, or if they want to remain focused on academic laboratory research. To the providers of supplementary training, which may or may not be appropriate, we can deliver potential entrepreneurs with requisite confidence, skills, and dedication to fully participate in their valuable resources.

THEORIES DRIVING BUSINESS ENCOUNTERS: LIFE SCIENTIST

The sim enhances long-term behavioral change by letting participants experience the antecedents to self-efficacy for entrepreneurship. They:

1. Experience going through the steps of entrepreneurship (mastery and practice) and learn the language, requirements, steps involved, and available resources.
2. Observe and learn from characters modeled on real-world success stories (vicarious learning).
3. Receive encouragement to become an entrepreneur through simulated mentoring (social persuasion).



The planned interventions are informed by the following theories and evidence.

Ajzen's Theory of Planned Behavior Model^{β8} links beliefs to behavior. An adaptation applied to entrepreneurship³⁹⁻⁴⁶ outlines the importance of attitude, norms, and the perception of behavioral control as precedents of behavioral intent and change⁴⁷⁻⁵¹. We apply the theory in the initial design of scenarios/cases to identify factors in the experience of a scientist that are most likely to impact future entrepreneurial behavior by addressing key weaknesses or concerns. Further, we will devise a process to match the experience to each user's specific needs before each of the interactions.

Shapero and Sokol's Entrepreneurial Event Model^{43,52} holds that an individual's intent to start a business is secondary to perceived desirability, willingness to take advantage of an opportunity, and the perception the activity is feasible. The ability to start a business depends upon preparation and personal confidence in the capability to start a business. This project emphasizes entrepreneurial readiness by developing scientists' confidence through practice and assessment of barriers, skills, and areas requiring additional training. According to the model, this project opens up the opportunity to pursue entrepreneurship, especially for individuals who previously lacked preparation and confidence.

Entrepreneurial self-efficacy^{53,54} refers to believing in one's ability to perform the role and tasks of being an entrepreneur successfully⁵⁵. It correlates with and predicts the amount of entrepreneurial intention^{16,55} and prepares life scientists for the change to entrepreneur^{56,57(chap2)} and commercialization. success^{42,44-46,53,58}. Common barriers to entrepreneurial self-efficacy include

anxiety and institutional barriers. Known biases in funding and business negotiation hinder women and disadvantaged individuals. Our project cannot tear down institutional barriers, but can highlight compensatory skills and heighten confidence through preparation, tailored scenario/case-based practice, and debriefing.

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