

**“WE ARE EWITS - HEAR US ROAR!”:
EMPOWERING WOMEN IN TECHNOLOGY STARTUPS (EWITS) AS AN
EXPERIENTIAL LEARNING MODEL TO CHALLENGE GENDERED SOCIAL NORMS
IN THE FIELD**

By

CHERYL D. CALHOUN

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

2017

© 2017 Cheryl D. Calhoun

To my wife and family

ACKNOWLEDGMENTS

First, I would like to thank my wife, Ester, for her support and encouragement throughout this process. She provided many hours of reflection, including some challenging debate, about my ideas and understanding of my work. She was also patient, and incredibly supportive, when I just needed space to work things out for myself. I would also like to thank my children, Sean, and Jessica, who supported me along the way and never doubted that I would accomplish this goal.

I would like to thank my Santa Fe College family. The incredible professionals at the educational centers and throughout the college who provided support and understanding while I juggled a full-time academic career along with a full-time pursuit of a PhD.

I thank the faculty at the University of Florida, who challenged me in the classroom, and worked with me as I integrated my classroom learning into my years of experience in academia. I thank my committee members, Dr. Kara Dawson, Dr. Rosana Resende, and Dr. Andy Naranjo, who provided challenging feedback and pushed me to refine my thinking and align my research goals. I would like to thank my chair, Dr. Carole Beal, who continually reminded me the dissertation is just one step in the journey, and not my full life's work. Without her constant encouragement to limit my scope creep, I am sure this volume would be twice as long. Her clarity of thought and focus on doing what I needed to do and leaving the rest for later is what allowed me to complete in a timely fashion.

TABLE OF CONTENTS

	<u>page</u>
ACKNOWLEDGMENTS	4
LIST OF TABLES	8
LIST OF FIGURES	9
LIST OF ABBREVIATIONS	10
ABSTRACT	11
CHAPTER	
1 INTRODUCTION	13
Background and Rationale for the Study	13
Theoretical Perspective	15
Gaps in the Literature	16
Research Design	17
Context	17
Methodology	18
Research Questions	19
Significance of the Study	19
Organization of the Dissertation	20
2 LITERATURE REVIEW	21
Women’s Low Participation in Technology and Entrepreneurship	22
Why is Diversity Important?	26
Economic Success	26
Equitable Opportunities	27
Gender Theories	28
Defining Gender	29
Gender Bias in a Gendered Field	30
Gendered roles	31
Gendered field	33
Ambient Belonging	36
Entrepreneurship Theories	38
Rational Models of Entrepreneurial Intent	38
Extended Theories of Entrepreneurship	41
Educational Theories	43
Gaps in the Literature	45
Summary	46

3	METHODOLOGY	48
	Research Questions	48
	Research Design	48
	Case Study Approach	49
	Mixed-Methods Design	50
	Feminist Epistemology	51
	Context	52
	Data Collection	53
	Phase One (Review of Existing Artifacts)	54
	Phase Two (Semi-Structured Interviews)	55
	Data Analysis	57
	Procedures	57
	Phase One Analysis	58
	Learner application	58
	Learner end-of-course surveys	59
	Phase Two Analysis	63
	Participant interviews	63
	Qualitative analysis	64
	Limitations and Assumptions	65
	Perspectives of the Researcher	65
	Intersectionality	66
	Population Bias	67
	Summary	67
4	RESEARCH FINDINGS	68
	EWITS	68
	Program Description	69
	Ewits Participants	73
	Organizers and subject matter experts	73
	Mentors	74
	Learners	77
	Entrepreneurial Identities And Role Models	81
	Entrepreneurial Identities	82
	Role Models	83
	Participants' Experiences in Ewits	85
	The Reported Impact of Ewits	85
	Competence building and validation	86
	Increased entrepreneurial intention	89
	Awareness of gender issues	90
	A Unique Learning Environment	93
	Challenging yet rewarding	94
	Safe space	95
	Mentorship and collaboration	97
	After Ewits	101
	Chapter Summary	103

5	DISCUSSION, LIMITATIONS AND RECOMMENDATIONS	105
	Discussion	105
	Research Question One	105
	Experiential learning model.....	106
	Learning environment	107
	Research Question Two	108
	Confidence in entrepreneurial abilities	109
	Combating gendered sociocultural norms.....	110
	Research Question Three	111
	Envisioning Entry in Technology Entrepreneurship	112
	Limitations.....	113
	Recommendations.....	116
	Recommendations for the Educational Model	116
	Recommendations for Future Study.....	117
APPENDIX		
A	LEARNER APPLICATION	118
B	END-OF-COURSE SURVEY	119
C	INTERVIEW PROTOCOL DOCUMENTS.....	121
D	TIDYING THE DATA.....	127
	REFERENCES.....	142
	BIOGRAPHICAL SKETCH.....	149

LIST OF TABLES

<u>Table</u>	<u>page</u>
3-1 Alignment of research questions to data sources and analysis.	54
3-2 Interview Participants, Their Career Field, Highest Degree, and Entrepreneurial Experience	57
3-3 Themes and number of references for each theme	65
4-1 Applicant Results by Cohort	79
4-2 Percent of Applicants Who Indicated Source of Motivation	79
4-3 Learner background information for Cohorts 2015 and 2016	80
4-4 Mean responses on Entrepreneurial Intention Questionnaire (EIQ)	90

LIST OF FIGURES

<u>Figure</u>		<u>page</u>
1-1	Scientists and engineers working in science and engineering occupations: 2015	23
1-2	Noninstitutionalized resident population of the United States ages 18-24, by race, ethnicity, and sex: 2014. Source: National Science Foundation.	24
2-1	Models of entrepreneurial intention as related to sociocultural theories.	41
4-1	Mentor Feedback.....	77
4-2	Distribution of Applicants by Degree.....	79
4-3	Self-reported impact on perceived competencies before and after Ewits	88
4-4	Self-Reported impact on perceived challenges before and after Ewits.....	89
5-1	A model for understanding the impact of gender bias and ambient belonging on entrepreneurial intentions.	113

LIST OF ABBREVIATIONS

AAUW	American Association of University Women
Ewits	Empowering Women in Technology Startups
NCWIT	National Council of Women and Information Technology
PA	Personal Attitude
PBC	Planned Behavioral Control
SEE	Shapero's Entrepreneurial Event Model
SME	Subject Matter Expert
SN	Social Norm
TPB	Theory of Planned Behavior

Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

“WE ARE EWITS - HEAR US ROAR!”:
EMPOWERING WOMEN IN TECHNOLOGY STARTUPS (EWITS) AS AN
EXPERIENTIAL LEARNING MODEL TO CHALLENGE GENDERED SOCIAL NORMS
IN THE FIELD

By

Cheryl D. Calhoun

December 2017

Chair: Carole Beal
Major: Curriculum and Instruction

This research seeks to understand whether educational intervention can help women succeed in technology entrepreneurship, a career field where women are underrepresented but where economic opportunity is high. This study examines women’s experiences with technology entrepreneurship within the context of an all-female experiential entrepreneurial education program, Empowering Women in Technology Startups (Ewits). Ewits uses an experiential learning model of entrepreneurship education, specifically designed to expose women to the technology commercialization process, develop the skills to form a technology startup and inspire and empower them to pursue leadership roles in technology-based companies. Using a feminist epistemology and a mixed-methods case study design, the data were analyzed through a theoretical lens of ambient belonging and gender bias. The theories of ambient belonging and gender bias were used to guide inquiry, as well as to examine the effects of program participation and participants’ resulting entrepreneurial attitudes and intentions. The findings of this study indicate that program is effective in both helping women to develop both the competencies and the confidence to become

entrepreneurs. More importantly, the program created a learning environment that was effective in shifting participants perspectives of the gendered social norms of the field. This research has implications for the field in understanding how women experience entrepreneurship and how their perceptions of gendered social norms affect their desire to enter technology entrepreneurship. An updated model of planned behavior is presented which considers the effect of biased social norms on intention.

CHAPTER 1 INTRODUCTION

This research seeks to understand whether educational intervention can help women succeed in technology entrepreneurship, a career field where women are underrepresented but where economic opportunity is high. The study focuses on an experiential learning model of entrepreneurial education, EWITS, specifically designed to expose women to the technology commercialization process, develop the skills to form a technology startup, and inspire and empower them to pursue leadership roles in technology-based companies. Experiences of program participants were documented and analyzed to understand what effect this model of education has on entrepreneurial attitudes and intentions, as well as to learn how women attempt to overcome barriers to entry into technology entrepreneurship. Using a mixed-methods case study design, the data were analyzed through a theoretical lens of ambient belonging and gender bias. The resulting case study describes the experiences of the program participants, highlights the factors that led them to the field of technology entrepreneurship, and examines how they have responded to barriers they experienced along the way.

Background and Rationale for the Study

The participation of women in the fields of technology, entrepreneurship, technology licensing, and patenting is historically low. At the time of this writing, Harvard Business School Working Paper 17-046, *Diversity in Innovation* (Gompers and Wang, 2017) is reporting that fewer than 10% of tech startups are owned by women, and less than 6% of venture backed technology startups are owned by women. While women represent 39% of all small business owners, they are more highly represented in small “lifestyle” businesses and are underrepresented in both technology start-ups, and

venture capital backed firms (Gilpin, 2015, Brush et al., 2014, Hill, 2016). Women are underrepresented in many STEM-related fields, both in academia and in the workforce. While there have been some gains in female participation in science and math, the number of women entering technology and engineering fields remains extremely low.

Not including more women in the technology and entrepreneurial workforce affects many societal issues including gender pay equality, the effectiveness of technological innovation, the overall profitability of startup ventures, and the ability to continue to grow the economy. According to the American Association of University Women (AAUW), in 2014, women working full-time in the United States earned only 79% of salaries compared to men for the same position (AAUW, 2016). Women are often more highly concentrated in lower-paying career fields and underrepresented in higher-paying careers such as technology and entrepreneurship. Just as we see in the general workforce, women are more highly represented in low-paying entrepreneurial ventures and under-represented in higher-paying entrepreneurial business enterprises.

Having more diverse leadership and development teams is good for our society. Research shows that companies with diverse leadership teams are more successful, develop better products, and earn higher revenues (Dawson et.al., 2014). Venture-backed companies with leadership teams that include women on average earn 12% more revenue than male-led companies. Successful technology startups have twice as many women in senior positions as do unsuccessful companies (Brush et al., 2014, Canning et al., 2012). By increasing the number of women entering technology entrepreneurship we can therefore potentially increase the wage-earning potential of

females as well as increase the economic success of technology startups in our economy.

Theoretical Perspective

Two sociological theories guide the theoretical perspective of this research. The first is the theory of gender bias which applies to the external influences and inherent biases in the gendered fields of technology and entrepreneurship that act as barriers to an individual's entry and later success. The second is the theory of ambient belonging which addresses an individual's internal motivation and intentions about entering a career or field of study. Gender bias may also affect ambient belonging in that knowledge of gender biases may be the catalyst for the development of cultural stereotypes or serve as a deterrent to anyone who feels these biases will create an unfair disadvantage for their success.

Gender bias: This is a bias that affects the way we perceive certain things, persons, or groups of people based on their gender (Rhode, 2017). Feminist theory proposes that the fields of technology and entrepreneurship have become gendered fields (Calás and Smircich, 2009). The culture has aligned with masculine societal norms in a way that creates a gender bias. This bias may cause women to appear less successful than men because their way of undertaking technology entrepreneurship may be different from the norm (Ahl, 2006; Bruni, 2004; Hughes, 2012). Some studies show that women value a return on social investment and thus focus on creating more sustainable long-term growth businesses (Calás and Smircich, 2009, Fink and Haisley, 2015). This approach to conducting entrepreneurship differs from the traditional high economic growth models of entrepreneurship. Because traditional standards of success value strong economic growth models, a bias may exist against entrepreneurs who

more highly value returns on social investment. Since women, on average, value returns on social investment more highly, they are more adversely affected by this bias.

Ambient belonging: This is a term developed by Sapna Cheryan (Cheryan et al., 2009) to describe the ability of individuals to imagine themselves as belonging in a particular environment. The social-cultural stereotypes affect the sense of ambient belonging an individual has of a field's culture or the persons in that area. If one cannot imagine themselves as belonging to the culture of a field or connecting to the individuals in the field, they are less likely to choose this as their career path. For example, if we think of an entrepreneur as someone who is confident, driven, and works 80+ hours a week ruthlessly pursuing business and economic goals, and an individual cannot imagine themselves as this person, then they may have difficulty imagining themselves as an entrepreneur.

Gaps in the Literature

To address the gender gap in technology entrepreneurship, a better understanding of the barriers women face in these fields is needed. The research on women's participation in technology entrepreneurship and educational intervention is contradictory and not conclusive (Ahl, 2006, Piperopoulos and Dimov, 2015). Some studies have tried to explain the low participation of women in entrepreneurship and technology-related fields by looking at factors such as women's quantitative skills, aversion to risk, or reluctance to sacrifice time with family (Henry et al., 2016). This research has been unsuccessful in showing any clear differences between men and women (Henry et al., 2016, Ahl and Marlow, 2012, Henry et al., 2015, Santos et al., 2016). The empirical research studies point to a need for more research into the participation of women in both technology and entrepreneurship, entrepreneurship

education, and the university technology transfer pipeline (Ahl, 2006, Cabrera and Mauricio, 2017, Calás and Smircich, 2009, Calas et al., 2009). During this literature review, no research studies were identified which focus on experiential learning models of entrepreneurship education specifically designed to address the issues women face when preparing to enter technology entrepreneurship.

Research Design

This research is situated within the context of Empowering Women in Technology Startups (Ewits) an experiential entrepreneurial education program offered through the University of Florida Innovation Hub. The results are reported using a case study design which allows the researcher to tell a complete story about the participants and their experiences. The data collection and analysis uses a mixed-methods design with both quantitative and qualitative data collected from program artifacts and semi-structured interviews. The data were analyzed to answer the research questions and to evaluate the theoretical perspectives of gender bias and ambient belonging using feminist epistemology as a guiding principle.

Context

The case study utilizes the place and time-bound system of Empowering Women in Technology Startups (Ewits) educational program. Ewits is a women's entrepreneurial education program designed to help women learn about the technology licensing process and gain the self-efficacy to succeed in the technology start-up sector. By selecting Ewits for the case study, this researcher could look more deeply at how and why program participants approached technology entrepreneurship and how their participation in Ewits affected their entrepreneurial attitudes and intentions.

The women associated with this program, regardless of their roles, described a dynamic process of learning and growth for their participation. The participants can be grouped into four different stakeholder groups. The following descriptor terms are used to describe each of the different stakeholder groups.

- **Organizers:** the women who conceptualized, designed, and facilitated the program;
- **Mentors:** the women who led the teams through the learning process;
- **SMEs (Subject Matter Experts):** the authors and presenters of program curriculum including the venture capitalists and angel investors who served as judges and evaluated the investor pitch competitions and business plans;
- **Learners:** The women who applied to and participated in the program.

The Ewits program has been offered annually since 2012. To date, there have been five cohorts, with 283 applicants, 239 women participating as learners in the program, and 222 women completing the program. There are eight program organizers, 35 mentors, and 29 nine subject matter experts (SMEs), for a total of 311 program participants. In addition, there were several women who were invited to participate as presenters during the weekly informational sessions. These women talked about their experiences as female leaders and entrepreneurs including how they experienced gender disparities, gender bias, and other gender related issues in their careers and leadership roles.

Methodology

The mixed-methods design was selected because it allows the researcher to address some of the concerns of earlier research in the ability to tell a deeper story about study participants. The mixed-method design incorporates the most compelling features of both quantitative and qualitative data. The feminist epistemology uses a

post-structural feminist approach which looks at gender as socially and culturally constructed. Data collection occurred in two phases. During Phase One, existing program artifacts, including learner applications, summative course evaluations, follow-up surveys, course curriculum, team business plans, investor pitch presentations and judges' scoring sheets were collected and analyzed. The initial analysis from Phase One informed the development of Phase Two, which consisted of semi-structured qualitative interviews with individuals from three groups of program participants (organizers, mentors, and learners). The interviews were thematically coded and analyzed along with data from Phase One to formulate answers to the research questions.

Research Questions

This research study seeks to answer three main questions:

1. How does Ewits strive to help women overcome barriers to entry into technology entrepreneurship?
2. What impact does Ewits have on participants' entrepreneurial attitudes and intentions?
3. How do participants describe their experience with entrepreneurship?

Significance of the Study

The study contributes to the knowledge of how an educational intervention can help women gain efficacy towards technology entrepreneurship. These understandings will guide development of future educational programming as well help programs such as Ewits improve their impact on the women that participate in the program. The experiences of these participants can inform our understanding of how women actively engage in practices that lead to positive entrepreneurial attitudes and intentions and that may negate the negative influences of gender bias in technology entrepreneurship.

In addition, insights are gained into participant's feelings of ambient belonging in a gendered field. The results from this research can be used to impact the gender inequality in technology entrepreneurship and help to diversify the technology startup workforce.

Organization of the Dissertation

This introduction presented an overview of the research including background and rationale, theoretical perspectives, and research design. In Chapter 2, the Literature Review will discuss the relevant literature including the status of women's participation in technology entrepreneurship, the case for diversity, including relevant gender theories, entrepreneurial theories, and educational theories. Chapter 3 covers Methodology, which will include data collection, data analysis, and the limitations and assumptions of the research design. Chapter 4 includes the findings from the data collection and analysis. Chapter 5, will discuss the main findings from this research, including the limitations of the study and conclude with recommendations for future studies.

CHAPTER 2 LITERATURE REVIEW

The first appearance of a research article on women in entrepreneurship was written by Eleanor Brantley Schwartz in 1976, with little published after that until the 1980s. While some research has been conducted on women's participation in technology entrepreneurship, most of the research to date has been focused either on women in technology or women in entrepreneurship. Some studies have tried to explain the low participation of women by looking at factors such as women's quantitative skills, aversion to risk, or reluctance to sacrifice time with family. However, this research has been unsuccessful in showing any clear differences between men and women (Henry et al., 2016, Ahl and Marlow, 2012, Santos et al., 2016). While women represent fifty-seven percent of the professional occupations in the U.S. workforce, their rates of participation in entrepreneurship and technology occupations have remained disproportionately low (Womenable, 2014). The issue of low participation of women and minorities in technology and entrepreneurship has attracted much attention.

Organizations such as the National Center for Women and Information Technology (NCWIT), the Anita Borg Institute, Lean In, Girls Who Code, The Diana Project, to name a few, are actively working to increase the number of women in computing fields.

Despite this attention, little progress has been made to successfully address current inequities and lack of participation in this field.

Using the lenses of gender bias and ambient belonging, this study aims to understand how an experiential learning based educational program contributes to empowering women in technology and entrepreneurship. This literature review will explore the status of women's participation in technology and entrepreneurship and

address why diversity in these intersecting fields is important to society. Several related theories are explored, including gender theories, entrepreneurship theories, and educational theories. This chapter begins with a discussion of why diversity is important in technology entrepreneurship. Next, it presents relevant research on gender theories including gender bias and ambient belonging, entrepreneurship motivational theories, and relevant research which focuses on increasing entrepreneurial attitudes and intentions. The chapter concludes with an overview of the gaps in the literature.

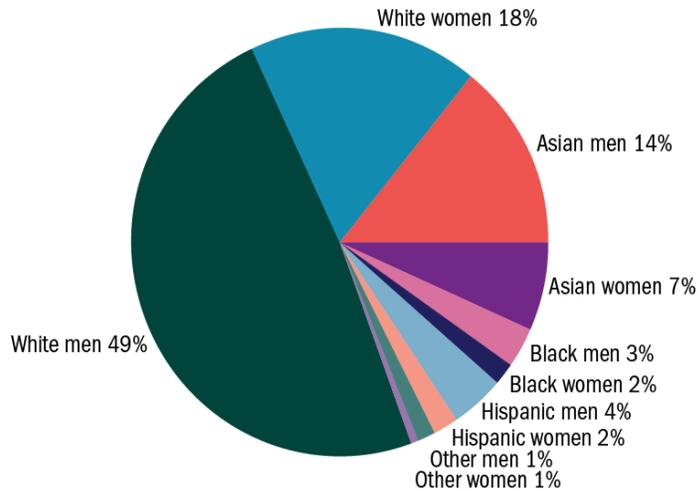
Women's Low Participation in Technology and Entrepreneurship

It is difficult to find specific data about women's participation in technology entrepreneurship. While it is known that the involvement of women in technology and entrepreneurship careers is low, the actual numbers of women working in technology occupations are often difficult to track due in part to tech firms self-reporting their own data. Often, technology firms will report diversity data based on the total number of employees, but when the data are further analyzed, it is revealed that many of their female employees occupy non-tech roles such as human resources or sales (Fussell, 2016). A broader understanding of the trends involved in women's participation in technology and entrepreneurship can be developed by considering (1) occupational employment data, (2) the degrees females earn in higher education, and (3) data related to women's representation in venture capital funding and patenting.

Using the data from the 2014 noninstitutionalized resident population of the United States aged 18 to 64 (NSF, 2017) in Figure 1, we can see that white men currently represent 49% of the individuals working in science and engineering occupations (S&E), including computer science. Asian men represent 14% and Asian women make up 7% of the S&E workforce. When these populations are combined,

white men, Asian men, and Asian women make up 69% of the S&E workforce, yet they only represent 36.7% of the total U.S. population (Figure 2). From this, we can see that the rest of the populations (White women 18%, Black women and men 5%, Hispanic women and men 6%, and other 2%) are underrepresented in that their proportions in the S&E workforce equals 31% yet their percentage of the U.S. population is 64%. Women overall represent only 30% of the S&E workforce. Unfortunately, these numbers are not getting any better, in fact, in many cases, they are getting worse. The number of women in computing-related jobs has dropped from a high of 35% in 1990 to a low of 18% in 2014, while the number of men in computing increased by 11% during this same period (Hill and Corbett, 2015).

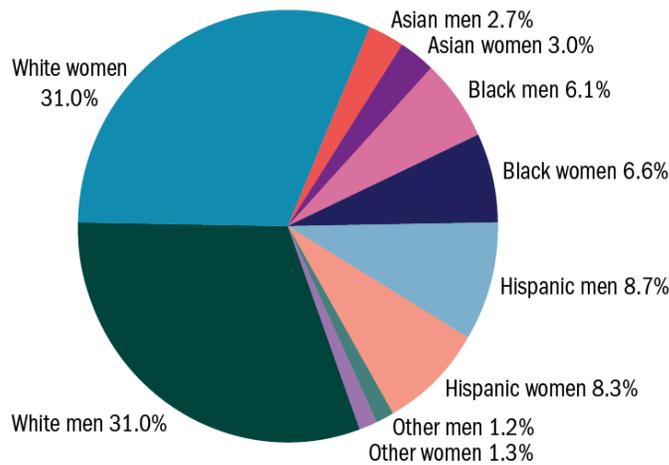
Scientists and engineers working in science and engineering occupations: 2015



NOTES: Hispanic may be any race. Other includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and multiple race. *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017*

Figure 1-1. Scientists and engineers working in science and engineering occupations: 2015

Noninstitutionalized resident population of the United States ages 18–64, by race, ethnicity, and sex: 2014



NOTES: Hispanic may be any race. Other includes individuals not of Hispanic ethnicity who reported more than one race or a race not listed separately.

Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017

Figure 1-2. Noninstitutionalized resident population of the United States ages 18-24, by race, ethnicity, and sex: 2014. Source: National Science Foundation.

Another source for examining women participation in technology and entrepreneurship is students’ degree choices by gender. From 1993 to 2013, the percentage of women earning college degrees in the U.S. rose from 46% to 53% (Finamore and Khan, 2015) and by 2014 women earned 57% of all bachelor’s degrees (NSF, 2017). A variety of means have been identified that have led to these gains including a) decreasing discrimination against women; b) better supports for balancing work with family life; c) girls receiving better academic preparation for higher education; d) the feminism of the teaching profession; and e) a learning environment more conducive to girls’ social and cognitive dispositions (Ashcraft and Blithe, 2009). Despite this parity in some areas of education and overrepresentation in others (e.g., 70% in psychology) women’s participation in technology-related disciplines is still disproportionately low. Women receive more than 40% of the bachelor’s and master’s

degrees in math, but these numbers tend to drop off to 30% at the doctoral level (NSF, 2017) and Computer Science education programs have seen the number of female students drop from a high of 37% in 1986-87, down to 18% in 2014 at the bachelor degree level (Barker et al., 2014, NSF, 2017).

Third, studies have shown a drop-in participation rates in venture capital firms and continued low participation of women in top-level management positions. As of 2014, nearly 9.1 million women-owned firms accounted for 30% of all enterprises (Womenable, 2014). Moreover, firms owned by women of color represent only one-third of the women-owned companies or only 10% of total enterprises. Teare and Desmond (2015) conducted a review of the more than 14,000 U.S.-based startups listed in the CrunchBase database. They found that only 18% of startups listed had at least one female founder. Brush et al. (2014) found that the number of women partners in venture capital firms was only 6% in 2012, down from a high of 10% in 1999, and only 2.7% of venture-backed companies had female CEOs. Many women who do make it up the ranks into technology leadership positions tend to leave the industry at mid-career. Some estimate as many as 45% will leave before moving beyond mid-level positions (Harkinson, 2014, Labor, 2014)

A similar pattern of low participation by women exists in obtaining technology-related patents. The percentage of U.S. patents in information technology (IT) for the 30-year period from 1980 to 2010, that had at least one female inventor was only 13% (Ashcraft and Breitzman, 2012). When controlling for the percentage of those patents that included male participation, the women's participation was only 6.1% of U.S. invented IT patents.

Why is Diversity Important?

Research has shown that more diverse teams are more creative, more successful, and create a higher net profit and return on investment (Barker et al., 2014). In addition, there is the simple fairness argument of ensuring women and underrepresented minorities have access to high paying and rewarding jobs (Hill, 2016).

Economic Success

Having diverse development teams helps to ensure the development of technologies that are more robust and efficient in meeting the needs of a diverse society, and in turn earn more profit for their developers. Problems cited in machine learning and artificial intelligence illustrates that software development often does not include the needs or perspectives of minority individuals (Eveleth, 2016). Some examples include the inability of facial recognition software to see dark-skinned faces or voice recognition software to hear and interpret higher pitched voices. “Leaving out half of the population is leaving out half of the ideas, and they’re ideas that the world needs. Diverse founding teams, employees, and board members are good for the bottom line (Gilpin, 2015).” A diverse society benefits from technological and educational tools that are designed to meet its needs. Diversifying the workforce that creates and produces these products will help ensure that we design technology that works for the broad spectrum of our diverse population. Brush et al., (2014) report that venture-backed companies with leadership teams which include women earn 12% more revenue than male-led companies, and successful technology startups have twice as many women in senior positions as do unsuccessful companies.

Equitable Opportunities

In 2014, women working full-time in the United States earned only 79% of what men working full-time earned, representing a gender pay gap of 21% (DeNavas-Walt and Proctor, 2015). While the gap has narrowed since the 1970s, progress towards pay equality continues to be slow. The pay gap is even larger for minority women. Hispanic and Latina women earn only 54% of what white men earn and 89% of what Hispanic and Latino men are paid (Hill, 2016). While educational achievement, career choice, years of experience, and other factors can explain a part of this gap, as much as 12% still is unexplained (Dey and Hill, 2007). Corbett and Hill (2012) compared earnings of approximately 15,000 women and men one year after college graduation and showed that in 2014 women earned only 82% of what their male counterparts were earning, even when accounting for differences in degree fields. That pay gap had widened ten years after graduation when women earned only 69% of what men earned.

Choices of college major and career field do affect overall pay and lifetime earnings. Again, there is a pay gap, where more traditionally female-dominated career fields tend to have lower overall salaries than do male-dominated career fields, even when those fields have similar educational and skill preparation requirements (Dey and Hill, 2007). For example, women are more likely to choose fields such as education and social science, both of which have proportionately lower average pay, than areas such as engineering and computer science which are more often chosen by men (Hill, 2016, Corbett and Hill, 2012, Dey and Hill, 2007). This variance in salaries has far-reaching implications, including lower overall lifetime earnings, lower ability to repay college loans and fewer resources for providing support for families.

“Because field of study is viewed as a free choice, many people do not consider the segregation of men and women into different college majors to be an issue of equal opportunity. Yet subtle and overt pressures can drive women and men away from college majors that are nontraditional for their gender. The segregation of men and women into different college majors is a long-standing phenomenon that persists today (Corbett and Hill, 2012, p. 12).”

Women can be encouraged to enter fields such as science, technology, engineering, and math (STEM) which offer higher pay scales (Dey and Hill, 2007). Educators can help to teach women about the opportunities available in STEM fields as well as how to succeed in these areas, including how to negotiate higher salaries that fairly compensate them for their knowledge and skills.

Gender Theories

While research has explored the question of why women are not participating in technology and entrepreneurship at the same rates as men, little progress has been made in increasing diversity in these fields. Some research has explored the question of whether females on average are less competent than males in the area of quantitative skills, others reveal an unwillingness to sacrifice time with family, while others question whether there may be a biological difference between the genders (Ahl and Marlow, 2012, Ahl, 2006). Research has been unsuccessful in showing a clear difference between males and females in regard to technology leadership roles, and in many cases, has been more successful in showing a lack of difference (Ahl, 2006, Doyle and Paludi, 1991, Fausto-Sterling, 1992). Feminist researchers suggest the need to broaden approaches, to explore cultural and societal issues that influence gender and racial diversity, including the use of a poststructuralist definition of gender as a societal

construct versus gender as a biological binary representation of sex (Calás and Smircich, 2009). A broadened approach includes consideration of physical and virtual environments; the role of media and the projection of female professional role models; and how families and cultural experiences influence diversity (Barker et al., 2014).

More current theories have highlighted the role of stereotypes about culturally constructed gender identities and how those stereotypes may affect diverse populations participation in technology and entrepreneurship careers. An individual's perception of stereotypes about their gender identity may impact how they perceive their fit or belonging to the culture in these fields (Cheryan et al., 2009). This is a concept described by Sapna Cheryan as ambient belonging. While commonly identified stereotypes do not accurately reflect all the individuals and environments in a given area, it can be argued that some of them do reflect the effects of gender bias inherent in a gendered field (Cheryan et al., 2015). To affect change, both external and internal influences need to be addressed. The following section begin by defining gender and then will discuss external influences of gender bias along with societal perceptions of gender and gender related social roles. Next, the internal influences of ambient belonging in a gendered field and stereotype threat are considered within the context of how stereotype threat affects ambient belonging.

Defining Gender

For the purposes of this research, a social constructionist or poststructuralist feminist perspective on gender is used. Biological sex is the binary representation of male versus female assigned at birth based on biological and anatomical features. Feminist scholars introduced the term *gender* to represent the socially constructed social practices and representations associated with masculinity or femininity (Acker,

1992). Gender, as expressed by masculine or feminine characteristics, is thus independent of an individual's biological sex. Society constructs its understandings of gender and gender expression to conform to norms of masculinity and femininity. As Spence (1993) showed, a person's gender identity does not always conform to all the attributes that are typically thought to be appropriate for their sex. Many individuals exhibit gendered characteristics that deviate from these culturally constructed norms. Some people are more masculine or more feminine than their socially constructed stereotypes would indicate. Gender expression is fluid in the respect that everyone has varying degrees of masculine and feminine characteristics. Gender expression is fluid in that at different times, and in different situations, a person may present more feminine or masculine qualities (Browne, 2007, Calás and Smircich, 2009).

Gender Bias in a Gendered Field

According to the Macmillan Open Dictionary (2017), gender bias is an “unfair difference in the treatment of men or women because of their sex.” Research has shown that gender bias very often occurs unconsciously. Gender bias may include small decisions or subliminal messages based on the cultural understandings we have of how gender affects an individual's ability to succeed in a circumstance. When a characteristic or skill (e.g., decisiveness) is culturally aligned with the performance of one gender (e.g., masculine), then that value may take on a gendered identity. The assumption that individuals of the opposite gender (feminine) would not be as proficient or successful with this characteristic or skill would constitute gender bias. This response can be conscious or entirely unconscious, which complicates the process of trying to shift and change cultural norms around gender bias (Ahl and Marlow, 2012, Bruni et al., 2004b, García and Welter, 2013, Yang and Aldrich, 2014). To understand more about

how gender bias effects women in entrepreneurship we will first look at the biases inherent in culturally constructed gendered roles and then we will consider how bias manifests in a gendered field.

Gendered roles

Social Role Theory originated as an attempt to describe the underlying causes of gender differences in social behavior (Eagly, 2013). Social role theory attempts to explain the interplay between cultural expectations and the expression of gender roles (Eagly et al., 2000). Gender roles differ based on situational cultural norms. They represent the cognitive and evaluative beliefs that members of our society hold about how individuals of a binary sex should look and act, and they facilitate the activities and behaviors of adults of each sex. Gender roles create constraints on behavior which influence the social structure of a given society. They are reinforced and replicated through the process of socialization and maintained through replicating patterns of behavior (Eagly et al., 2000).

Feminine gendered roles are often described as having communal qualities (e.g., pleasing physical appearance, kindness, and nurturance). Masculine gendered roles are often described as having agentic qualities (e.g., physical strength, assertiveness, and leadership). Consistent with these examples, occupational success is perceived to derive from agentic personal qualities to the extent that occupations are male-dominated, and from communal personal qualities to the extent that they are female-dominated (Eagly et al., 2000, Cejka and Eagly, 1999).

Research shows that there are greater differences in gender expression and behaviors within rather than between the two sexes (Santos et al., 2016, Eagly et al., 2000, Hoffman and Hurst, 1990). If a Venn diagram were drawn from the range of

gender expression and behaviors, one would see that there is more area in the overlapping section of the chart than there is in the non-intersecting areas. One would also see that the size of the variation within the sexes is larger than the variation between the sexes (Eagly, 1987, Swim, 1994). However, this evidence does not hold consistent with cultural norms and opinion about gender differences. In fact, gender stereotypes may serve to perpetuate gendered role distributions. Individuals assume the differences outsiders observe in attributes of the role occupants can be attributed to gender, when they may, in fact, correlate to learned behaviors (Hoffman and Hurst, 1990, Berndt and Heller, 1986, Broverman et al., 1972, Cejka and Eagly, 1999, Eagly, 2013, Jost and Banaji, 1994).

The long-held belief that women are more communal and men are more agentic is based on the traditional division of labor between men and women as providers and as homemakers (Cejka & Eagly, 1999). While some believe these role assignments are based on innate gendered characteristics, research has shown that Western societal structure effectively supports the development of the skills necessary to perform the roles individuals of each sex are expected to occupy (Williams and Best, 1990). The traditional categorization of women and men in sex-typical social roles and the incorporation of those roles into the history of societal culture and consensual gendered roles create a paradigm that encourages behavioral tendencies that differ in women and men. This influence creates both gendered stereotypical expectations and the self-regulation of behavior based on those expectations. Females and males thereby learn different skills and acquire different attitudes, as far as they occupy sex-typical roles (Eagly, 2013).

Gender role conforming behaviors are difficult to change due to the fact that this behavior may bring on a variety of negative reactions, or may not be rewarded in the same way that gender conforming behaviors are (Eagly et al., 2000). Cialdini and Trost (1998) suggests that whether people step outside stereotypical gender roles is influenced by whether they break idealistic or behavioral norms. They make a distinction between injunctive norms and descriptive norms. Injunctive norms are expectations about what people ought to do or ideally should do. Observations of deviations from an injunctive norm might be met with strong emotions or moral disapproval. Descriptive norms are expectations about what people do. Deviations from descriptive norms might be met with surprise but would not be considered inappropriate or met with moral disapproval.

Gendered field

Current feminist theory proposes that technology and entrepreneurship have become gendered fields (Ahl and Marlow, 2012, Bruni et al., 2004b). That is, the culture of entrepreneurship has taken on predominant characteristics that align with a culturally accepted perception of masculinity. This gendering process can be reflected in a) how certain characteristics are valued and define success in a field, b) the use of gendered language, or c) in the way research is conducted (Ahl, 2006, Bruni et al., 2004a, Calas et al., 2009, Bruni et al., 2004b). The masculine culture of these areas is brought into line with societal norms in such a way that those norms have become the standards of the individuals and organizations in these fields (technology and entrepreneurship). This gendering has the effect of causing masculinity to disappear from critical reflection, as it is the norm, and causes femininity to stand out, as it is the “other” from the norm. Anyone who behaves in a manner other than the masculine norm is not conforming to

the culture of the field. This “othering” will include not only biological females but also anyone who operates in a manner that is not consistent with the norms of the field. Since many of these norms align with both masculinity and white culture, this has a strong adverse effect on racial diversity as well as gender diversity.

Examining the common characteristics of technology and entrepreneurship, and of the individuals who work in these fields, provides a greater understanding of the features that create a gendered field. In *Gender and Entrepreneurship: An Ethnographical Approach* (2004b), Bruni, Gherardi, and Poggio look at entrepreneurship through the lens of a gendered field. Through ethnographic analysis, they examine five entrepreneurial companies to observe how gender influences their ways of doing business within the gendered entrepreneurial social culture. They found that while entrepreneurship pretends to be gender neutral, it has taken on the norms and values based on hegemonic masculinity, thus aligning the neutral position with masculinity and in effect creating a gender bias or “gender blindness” with relationship to male participation vs. female participation.

Helene Ahl’s article *Why Research on Women Entrepreneurs Needs New Directions* (2006) compared the words and phrases that are often used to describe successful entrepreneurs and entrepreneurship with words from Bem’s widely used masculinity and femininity index. Ahl found a high level of correlation to words associated with masculinity. For example, masculine identified words associated with entrepreneurship included “self-reliant,” “strong,” and “assertive.” She then used an antonym dictionary to construct a table using the antonyms of each of the words related to entrepreneurship. She found a high level of correlation between the antonyms and

words associated with femininity. For example, feminine words that did not appear in the texts analyzed included “affectionate,” “sympathetic,” and “understanding.” This analysis shows that how language is used to describe successful entrepreneurship is not gender neutral and that it favors descriptors that society has aligned with cultural perceptions of masculinity.

The tendency towards a masculine description of technology and entrepreneurship carries over into the research literature. Henry, Foss, and Ahl (2016) conducted a review of gender and entrepreneurship literature published in 18 journals over a 30-year period. They found the majority of research focused on large-scale, quantitative, male-female comparative research that attempts to show that there are core biological differences between men and women. These differences supposedly cause women to be less than suited for these fields. This type of research is fundamentally flawed because it evaluates binary differences against a gendered norm and has been unsuccessful in finding statistically significant differences between the sexes. Unfortunately, researchers have often attempted to explain away this lack of statistically significant differences between the sexes by making theoretical connections to differences between genders (Ramazanoglu and Holland, 2002, Henry et al., 2016, Ahl and Marlow, 2012, Ahl, 2006).

The theory of gender bias is used to help understand how external factors such as culturally gendered roles and expectations affect an individual’s entrepreneurial attitudes and intentions. In addition, the theory of entrepreneurship as a gendered field is used to examine how gender bias in the form of language and the way we do business can affect our perception of individual success rates. Gender bias can include

ways of being, including “doing gender” or “doing entrepreneurship.” For example, if decisiveness is considered a desirable trait exhibited by someone who is successful in entrepreneurship and decisiveness is considered by society to be a masculine trait, then individuals that align with society’s perception of masculinity are regarded as more effective in this field. An issue occurs when that trait (i.e., decisiveness) may not be a trait required for success, but rather a historical norm. There may be other traits that lead individuals to be successful that are filtered out of the workforce because of the gender bias inherent in these unconscious cultural alignments.

Ambient Belonging

Ambient belonging is a theory developed by Sapna Cheryan (Cheryan et al., 2009) to explain an individual’s ability to imagine themselves as belonging in a particular environment. Cheryan identifies stereotype threat as playing a key role in women’s ambient belonging. Stereotype threat is the concept that commonly held stereotypes about individuals identity can influence how we act and the choices we make (Steele, 2011). It has a long tradition of research linking identity to perceived performance according to specific stereotypes, whether they be based on race, gender, or other characteristics (Steele, 2011).

Cheryan et al. (2011) looked at how cultural stereotypes form and how gender stereotypes impact women’s choices and behaviors and their sense of ambient belonging. She and her research team conducted several studies using stereotypical vs. non-stereotypical environments, including physical classrooms, virtual classrooms, and written descriptions of corporate environments. In some of the scenarios, they varied the gender of the individuals represented in the classrooms and work environments using both stereotypical male/female representatives as well as non-stereotypical

male/female representatives. One hundred and twenty-one students in two different experiments were asked to complete a questionnaire about their interest in entering a degree or career in computer science or engineering. Female students who completed the questionnaire in the non-stereotypical environments were more likely to respond positively about technical careers than did the female students who were in the stereotypical settings. Female students also showed a higher rating of self-efficacy when they completed the questionnaire in non-stereotypical settings. In most cases, the male students were equally interested in computer science and engineering, regardless of the environment where the questionnaire was completed (Cheryan et al., 2012, Cheryan et al., 2015, Cheryan et al., 2009).

Stereotype threat can affect performance in school, our choices of careers, or even how we imagine ourselves in society (Steele, 2011). Stereotypes about culture may prevent diverse populations from entering technology and entrepreneurial careers because they do not see themselves as belonging to these areas. The perpetuation of stereotypes has an impact on how individuals make decisions about choosing a college major or career track. For example, popular TV shows or movies that perpetuate a stereotype about technology geeks may in effect deter individuals from choosing to enter a technology-related field. In essence, stereotypes of the field act as educational gatekeepers which constrain those who enter educational programs and ultimately the workforce in each of these areas (Cheryan et al., 2015).

Contextual influences have an impact on how likely individuals are to think of themselves outside of stereotypical gender assumptions. Cheryan (2012, 2015) (2012, 2015, 2011, 2009) shows that just being exposed to stereotypical items influences

female students' decisions to pursue a career in technology as well as their personal feelings of *self-efficacy*. Steele (1997, 2011) shows that just being reminded of one's identity can trigger negative responses and impact performance. Turner et.al. (1987) showed that individuals might be more likely to think of themselves with respect to stereotypical gender roles in a mixed gendered group. When in a single sex group, a wider range of non-traditional expressions was observed. This difference could be because the presence of the other sex triggers the perception of gender roles, and thus the stereotype threat is evoked.

Entrepreneurship Theories

When considering gender and the field of technology and entrepreneurship, it is also important to consider the influence of entrepreneurial attitudes and intention as a precursor to entrepreneurial behaviors (Ajzen, 1991). This section will first discuss two rational models of entrepreneurial intent: Shapero's (1982) Entrepreneurial Event Model and Ajzen's (1991) Theory of Planned Behavior as models for entrepreneurial intention. These models were not conceptualized to capture the role of gender in entrepreneurial intention. Therefore, I propose that theory of entrepreneurship as social change as compared to entrepreneurship as a positive economic activity as more appropriate for considering gender and entrepreneurial activity.

Rational Models of Entrepreneurial Intent

In Shapero's Entrepreneurial Event Model (SEE), entrepreneurial intention reflects the perceived desirability and feasibility of becoming an entrepreneur. In Ajzen's Theory of Planned Behavior (TPB), the entrepreneurial intention is described as one's personal attitude, perceived behavioral control, and perceived social norms. Personal attitude describes an individual's attraction towards becoming an entrepreneur

(desirability). Perceived behavioral control describes the ability to develop entrepreneurial behavior (feasibility). Subjective norm refers to the support of an individual's social environment or the culture in which they live and work (Hindle et al., 2009, Santos et al., 2016). These two models are comparable with a direct correspondence between perceived feasibility (SEE) and perceived behavioral control (TPB). Personal attitude (TPB) and perceived social norms (SN) are social and cultural influences of perceived desirability (SEE). Armitage and Conner (2001) in a meta-analysis of 185 independent studies provided efficacy for the use of TPB as a predictor of entrepreneurial intentions, especially for personal attitude and perceived behavioral control. They however, found a weaker link with perceived social norms and recommend "work on normative variables (e.g. moral or descriptive norms) may increase the predictive power of the normative component of the model" (Armitage and Conner, 2001, p. 489)

Santos, Roomie, and Liñán (2016) used the Theory of Planned Behavior model to evaluate "the interplay between gender differences and the social environment in the development of entrepreneurial intentions." In their study, they used the "Entrepreneurial Intention Questionnaire" (EIQ) (Liñán and Chen, 2009) as a measure of entrepreneurial intention and the factors of personal attitude, perceived behavioral control, and subjective norm. They administered the EIQ to 516 final-year business undergraduate students in two different European regions. Their results show that women do not naturally have lower entrepreneurial intentions than men. However, women are less likely to see themselves as entrepreneurs, which results in a lower personal attitude (perceived desirability) and perceived behavioral control (perceived

feasibility). In addition, they discovered that an increase in social valuation of entrepreneurship leads to an increase in entrepreneurial intention for men, but not for women. Santos et.al. argue that “females do not see entrepreneurship as a career choice for them” and “as a consequence, women’s personal perceptions and intentions are not affected by the value society puts on this activity” (pg. 59). These results are consistent with the theory of gender bias in a gendered field and ambient belonging. If women do not see themselves as entrepreneurs (perceived social norms), they are less likely to see entrepreneurship as a desirable career path.

Figure 2-1 proposes a new model to illustrate how the existing models of entrepreneurial intention relate with the concepts of gender bias and ambient belonging. In this model, the theory of ambient belonging, or an individual’s perception of fit in the field, affects their PA. For a female, the masculine gendered norms in the field would lower their perception of fit, and thus their PA. The effects of gender bias, and the related issues of social cultural roles and stereotype threat, effectively create a filter that prevents women from experiencing the advantages of increased cultural value or perceived subjective norms of entrepreneurship. Thus, when society, or the individual’s close community, more highly values entrepreneurship, they do not see that increased value as applying to them as females.

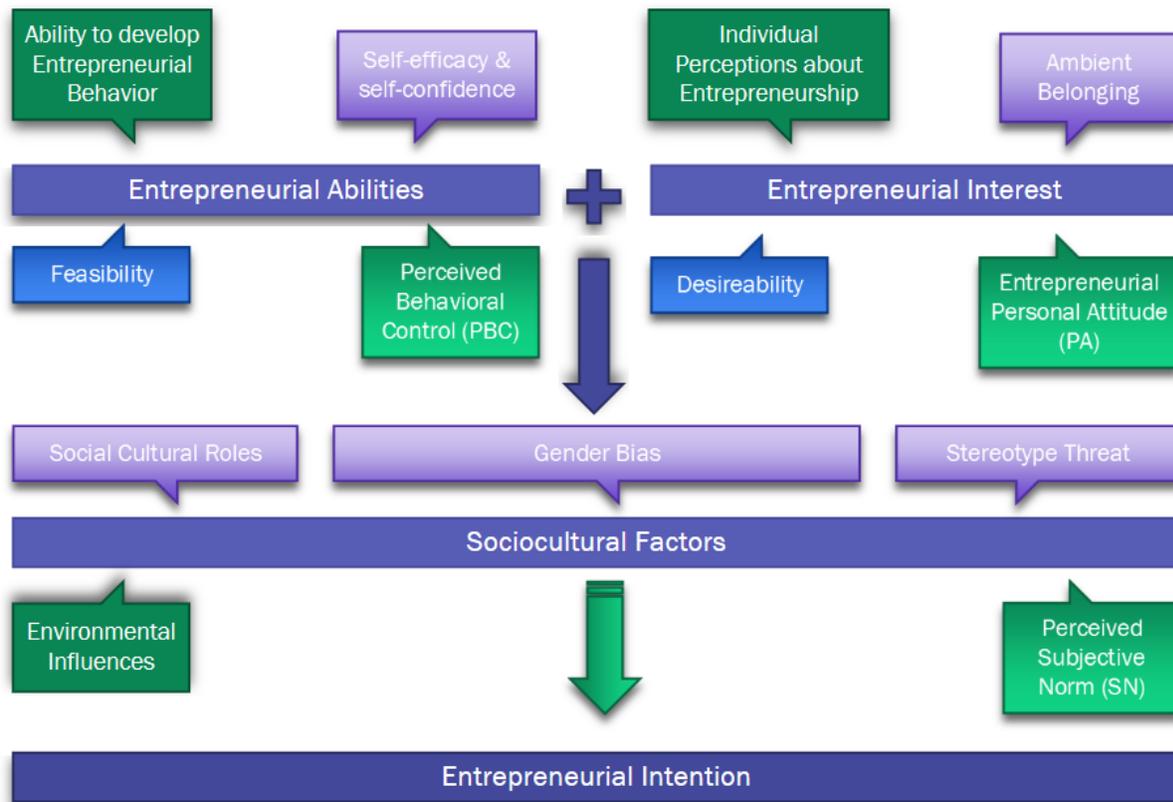


Figure 2-1. Models of entrepreneurial intention as related to sociocultural theories.

Extended Theories of Entrepreneurship

To address the issue of low participation of women in entrepreneurship, Calas and Bourne (2009) proposed extending the boundaries of entrepreneurship theory and research by reframing entrepreneurship as positive economic activity to entrepreneurship as social change. This moves the focus of entrepreneurship research from an outcome metric of positive economic activity or economic growth, to a process outcome of the 'doing' of entrepreneurship or creating social change. By reframing the research agenda to entrepreneurship as social change, the culture (or perceived culture) of entrepreneurship becomes the foci. This reframing of entrepreneurship as social change by Calas and Bourne is an attempt to bring the critical theorist approach

of feminist theory into the examination process. By applying the variety of feminist methodological viewpoints gender and racial diversity is viewed from varying perspectives. Each of these perspectives lends new insights to the equation and gives us a better viewpoint from which to understand the issues.

Helen Ahl (Ahl, 2006) also recommended reframing the research agenda in this manner. She points out that much of prior research has focused on entrepreneurship as an instrument for economic growth. By changing the discourse around entrepreneurial research from a focus on outcome, to a focus on process, we can begin to look more deeply at issues of gender equality and gender/power relations. We move away from research that looks at gender as a variable, to research that considers the context and social constructs of entrepreneurship. This could include studies of institutionalization of support systems for female entrepreneurs, cultural norms surrounding entrepreneurship, societal and familial support structures, and gendered divisions of labor.

In “Shattering Stereotypes: Women in Entrepreneurship” (2015), Fink and Haisley surveyed 483 C-suite executives and entrepreneurs from UK business. What they found shatters earlier stereotypes about women’s interest and propensity to succeed in an entrepreneurial environment. Fink and Haisley found women self-identify as just as interested in growing a business (92% vs. 90%) and are more interested in starting a new business (69% vs. 29%) or starting another business (47% vs. 18%) than men. However, women characterized their process of growing a business differently than did their male counterparts. Female entrepreneurs described a process of striving for steady, profitable growth trajectories where they often prefer to reinvest business

profits to scale sustainably, whereas male entrepreneurs tend to be more concerned with growth and a quick exit. Women also tend to see more barriers to growth and spend more time mitigating risk. They tend to rate their business skills similarly to men but are more likely to identify areas where they need to increase knowledge and skills. They also cite limitations to their support networks or describe barriers to growth (Fink and Haisley, 2015). Women describe the following factors related to their interests and success in entrepreneurship: (a) steady, profitable growth trajectories, (b) desire to reinvest profits and scale sustainably, (c) less likely to overestimate their businesses profitability, (d) more sensitive to risk, (e) prefer education or to be “coached,” and (f) show interest in networking events.

Educational Theories

Educational interventions can contribute to changing the perception of cultural stereotypes and personal attitudes that lead to a lack of ambient belonging. By changing the perpetuation of cultural stereotypes, perceptions can be shifted to a more realistic representation of the diversity of individuals and opportunities available to women and underrepresented minorities in technology-related fields and entrepreneurial enterprises. By challenging the prevalent cultural stereotypes about these areas, the diversity of students choosing technology entrepreneurship as a field of study may be increased. Recommendations from the current literature include (a) using effective pedagogy that employs constructivist and experiential learning opportunities (Piperopoulos and Dimov, 2015, Rideout and Gray, 2013) and depicting a wide diversity of individuals who are successful in these fields (Santos et al., 2016).

Experiential learning is based on a social constructivist model and is the “process through which a learner constructs knowledge, value, and skill from direct experience”

(AEE, 1994). It builds on the belief that education is not merely the transmission of facts, but the education of the entire person where the educational experience involves both the teacher and the learner engaged in a purposive experience (Dewey, 1917, Dewey, 1938). By exposing learners to real world problems and engaging them in solving these problems, they will be empowered to construct their understanding of these systems.

Specifically in the area of entrepreneurial education, Rideout and Gray (2013) found that “gender (being a woman) has a negative effect on intentions” and indicated a “need to develop a different causal model and perhaps different entrepreneurial education interventions for women” (Rideout and Gray, 2013, p. 354). Their recommendations include two approaches to entrepreneurial education: 1) the small business management model, and 2) the entrepreneurial venture focus model. Teaching technology entrepreneurship should use a more experiential learning model that includes “entrepreneurial self-efficacy, cognitive skills and knowledge, values and attitudes, social networks, and other contextual variables on policy-relevant entrepreneurial outcomes” (Rideout and Gray, 2013, p. 348). Entrepreneurship education should include the process of discovery, evaluation, and exploitation of opportunities, including the individuals who discover, evaluate and exploit these possibilities (Shane and Venkataraman, 2000).

Piperopoulos and Dimov (2015) found that participation in an entrepreneurship course can be effective in increasing or decreasing an individual’s entrepreneurial self-efficacy and ultimately their entrepreneurial intentions. They found results differed between theoretically or practically-oriented entrepreneurial education. Using

Regulatory Focus Theory, they evaluated 114 students enrolled in entrepreneurial educational classes that were either theoretically oriented (i.e., designed to teach the theories of entrepreneurship) or practically oriented (i.e., designed to teach how to run their own real-life business using a hands-on, team-based approach). They found the students in the theoretically-based courses saw a decrease in their self-efficacy and resulting entrepreneurial intentions, while the students in the practically-oriented courses saw an increase in their entrepreneurial self-efficacy and resulting entrepreneurial intentions.

Santos et. al. (2016), recommend focusing on helping women to increase their perceived attraction to and feasibility of entrepreneurship as a potential career choice. They recommend focusing on educational interventions that would help women gain both practical knowledge and access to resources as well as change their perceptions of the cultural environment of the field of entrepreneurship. These educational interventions could incorporate the inclusion of successful female entrepreneur role models and guest speakers who do not reflect the norms of a masculine-dominated field. They also recommended the creation of clubs and associations for female entrepreneurs that would help increase the visibility of entrepreneurship as a career choice for women.

Gaps in the Literature

While there is some research on entrepreneurial education, research studies which focus on entrepreneurship education models designed to help increase women's participation in entrepreneurship are lacking. The empirical research studies point to a need for more research into women's participation in both technology and entrepreneurship, entrepreneurship education, and the university technology transfer

pipeline (Ahl, 2006, Ahl and Marlow, 2012, Bliemel, 2014, Cabrera and Mauricio, 2017). Recent literature reviews including “Women Start-ups in Technology” (Kuschel and Lepeley, 2016), “Women Entrepreneurship: Research Review and Future Directions” (Yadav and Unni, 2016), “Gender and Entrepreneurship Research: A Review of Methodological Approaches” (Henry et al., 2016), “Does Entrepreneurship Education Really Work?” (Rideout and Gray, 2013), and “Why Research on Women Entrepreneurs Needs New Directions” (Ahl, 2006) all point to the need for additional research. In particular, these reviews indicate a need for research that a) considers gender as an influence in entrepreneurship and not as an independent variable or a comparison between male and female entrepreneurs (Marlow, 2002, Ahl and Marlow, 2012), b) focuses on the experiences of women as founders of technology start-ups (Kuschel and Lepeley, 2016), c) takes a more “critical view of how methodology in gender research needs to expand in the future” (Henry et al., 2016, p. 19), d) is grounded in post-structuralist feminist epistemology, including a balance of quantitative and qualitative data collection and analysis methods such as case-study, narrative and discourse analysis, and d) help us understand how to more effectively increase women’s participation in technology entrepreneurship (Kuschel and Lepeley, 2016).

Summary

This literature review began with an overview of women’s low participation in technology and entrepreneurship including a discussion of why diversity is important in technology entrepreneurship. Next, the use of gender in this study was defined, along with a discussion of gender theories including gender bias, social role theory, ambient belonging, and stereotype threat. Third, relevant theories of entrepreneurial intention were presented including Shapero’s Entrepreneurial Event Model, Ajzen’s Theory of

Planned Behavior, and Entrepreneurship as Social Change. Fourth, educational theories as they relate to entrepreneurial education were explored. And finally, the chapter concluded with a discussion of gaps in the literature.

CHAPTER 3 METHODOLOGY

This study was designed to evaluate whether an all-female experiential entrepreneurship education program, Ewits, had a positive impact on participating women's entrepreneurial attitudes and intentions including what factors contributed to this impact. The study also considered how involvement in the program helped participating women prepare to deal with barriers to entry and retention. Through a mixed-methods design the study analyzed five cohorts of data including participant applications, end-of-course surveys, and follow-up surveys and conducted interviews with 15 participants from three stakeholder groups. The quantitative data were analyzed using R, and the qualitative data were thematically coded using NVivo. The resulting analysis were reported in a case study format.

Research Questions

The questions this research addressed are:

1. How does Ewits strive to help women overcome barriers to entry into technology entrepreneurship?
2. What impact does Ewits have on participants' entrepreneurial attitudes and intentions?
3. How do participants describe their experience with entrepreneurship?

Research Design

The case study research approach for this study includes both quantitative (descriptive statistical analysis of demographic data as well as statistical analysis of program end-of-course surveys) and qualitative approaches (program document review and informal semi-structured interviews). This is a case study within the bounded system of an educational program and its participants, mentors, and program

organizers. By using the case study approach, we are better able to tell the story of the educational program and its participants. By looking more deeply at both the program and the participants, we can learn more about why and how they approach entrepreneurship, and how program participation has affected their entrepreneurial competencies, attitudes, and intentions. This research was conducted using the guiding principles of feminist epistemology.

Case Study Approach

Case study is a research approach where the investigator explores a real-life, contemporary bounded system over time. The research uses multiple sources of information, which may include observations, interviews, audiovisual materials, documents, and reports. The resulting research is reported as a case description with case themes. The research could include a single case (a within-site design) or a multiple case approach. The purpose of the case study is to understand a specific issue, problem, or concern. The results present an in-depth understanding of the case. Collecting many sources of data is required because relying on one source is not enough to develop this in-depth level of understanding (Creswell, 2013, Merriam, 1988, Merriam and Tisdell, 2015).

This research report uses a case study within a bounded system. The case study tells the story of Empowering Women in Technology Startups (Ewits) and its participants (organizers, mentors, and learners). By looking more deeply at both the program and the participants we can learn more about how they approach entrepreneurship and how their participation in Ewits has affected their entrepreneurial attitudes and intentions. The case study approach was selected because the study reviewed multiple sources of information in a bounded system. A within-site design is

used to look at the program over time. The research examined data from five cohorts of Ewits participants. The results are reported as a case description along with themes that emerge from the study.

Mixed-Methods Design

A mixed-methods design allows the researcher to use a variety of data collection methods which take advantage of the strengths of both quantitative and qualitative methods (Creswell and Clark, 2011). Both together can be used either linearly or iteratively to understand the problem more thoroughly faced by the community and work together with them to develop solutions or make a change (Creswell, 2013, Creswell and Clark, 2011, Mertens, 2012, Teddlie and Tashakkori, 2009).

The mixed-methods design was selected because it allows the researcher to address some of the concerns of earlier research in the ability to tell a deeper story about study participants. This is consistent with recommendations from Ahl, Henry, and Marlow (2012, 2016) recommending more innovative methodological approaches which utilize qualitative data and avoid male/female comparisons. Data collection occurred in two phases. During Phase One, existing program artifacts, including learner applications, summative course evaluations, follow-up surveys, course curriculum, team business plans, investor pitch presentations and judges' scoring sheets were collected and analyzed. This data included both qualitative data from program artifacts and open-ended survey questions. It also included quantitative data in the form of ordinal response survey questions. Phase Two consisted of semi-structured qualitative interviews with individuals from three groups of program participants (organizers, mentors, and learners). The interviews were thematically coded and analyzed along with data from Phase One to formulate answers to the research questions.

Feminist Epistemology

Feminist methodology is a means of conducting scientific investigations and generating theory from an explicitly feminist standpoint. It is a response to concerns about the limits of traditional methodology and an effort to capture the experiences of women and others who have been marginalized by society and by previous academic research (Henry et al., 2016, Naples, 2007, Ramazanoglu and Holland, 2002). This study utilizes a post-structuralist approach to feminist epistemology. As such, the research a) uses a definition of gender as socially and culturally constructed, b) approaches gender as an influence in technology entrepreneurship, c) is mindful of the intersectionality of race, class, gender, and sexuality, d) closely collaborates with Ewits organizers on data collection and analysis, and e) shares the study's results to consider and implement future changes in the Ewits program. The research acknowledges and continues to be aware of issues of privilege and the sociocultural paradigms and constructs that affect biases. In addition, the researcher as a formal and informal mentor, has been part of the Ewits community, and, as a female community college computer networking professor and entrepreneur is part of the broader tech and entrepreneurial community.

The data collection and analysis methodologies were selected to conform with current recommendations on feminist approaches to research on gender in entrepreneurship. Feminist research techniques and practices (choice of approach) include discourse analysis, ethnography, case study, interviews, and surveys. Feminist theories about how research is conducted (the approach in action) include qualitative, quantitative, or mixed methods (Calás and Smircich, 2009, Creswell, 2013). Henry and

Foss (2016) recommend the use of more in-depth qualitative methodologies such as life histories, case studies or discourse analysis.

Context

The context of this study is an all-female 10-week educational program designed to help women learn how to license a technology through the university technology transfer process and prepare to launch a startup based on the technology. The program is situated within an entrepreneurial incubator located at a large research one university. Program participants were recruited within the academic setting and the local community. The program is designed for women who already have college degrees and who have expressed interest in technology entrepreneurship. The experiential educational model uses a constructivist learning model where participants are matched with teams to serve as founders for mock startup companies. Each team is matched with a mentor and a technology is selected from the technology licensing office. The mentor acts as the mock CEO and helps to guide the team through the business plan creation process.

The teams take part in eight weekly educational sessions which introduce them to the technology licensing process, funding options, and business plan creation. Topics include value propositions, forming the management team, market analysis and strategy, commercialization strategies, intellectual property, financials, corporate structures, sources of funding, business plan development, and company presentations. The teams work between the weekly sessions to develop their business concept, write a business plan, and prepare an investor pitch presentation. The teams present their startup plans at an investor pitch competition during the final week of the program.

Four distinct categories of stakeholders were identified within the program participants. They are: 1) Organizers, 2) Mentors, 3) Learners, and 4) Subject Matter Experts (SMEs). The *Organizers* are women working in the technology licensing office and in various aspects of technological entrepreneurship who originally envisioned the need for the program and took part in the design and implementation of the program and curriculum. *Mentors* are successful female entrepreneurs and business women from the local community with a wide variety of expertise in startup companies, venture capital financing, and financial management. The organizers recruited them to serve as CEO's for the mock startup companies. The *Learners* are women who applied and were selected to take part in the program. Most of them have already obtained college degrees. Many have graduate degrees, while some are current graduate students. They make up the team members and founders of the mock startup companies. The *SMEs* are successful entrepreneurs, venture capitalists, and angel investors. They were recruited by the organizers from both inside and outside of the local area to serve as presenters and judges. They helped with the development of curriculum, recorded video presentations, presented during the course, reviewed business plans, rated investor pitches, and gave feedback to the learner teams.

Data Collection

Phase One of the data collection consisted of collecting, compiling, and analyzing existing program artifacts from five annual cohorts of program participants starting in 2012 through 2016. Phase Two of the data collection consisted of fifteen semi-structured interviews, including participants from each of the three stakeholder groups of Organizers, Mentors, and Learners. The SMEs were not interviewed as part of this research.

Phase One (Review of Existing Artifacts)

During Phase One a variety of program artifacts were collected and analyzed. These included learner applications and resumes, end-of-course learner surveys, two annual learner follow-up surveys, mentor, and SME bios; team business plans and investor presentations; judges' scoring sheets; as well as program curriculum items including presenter videos, participant guides, session outlines, and mentor training materials. For some years, there were minutes available from program organization, mentor, and judge's meetings, including both pre-planning and follow-up meetings, as well as other correspondence documenting participant feedback and recommendations. While all artifacts were reviewed to develop a deeper understanding of the program, the primary analysis was conducted on the learner application and the end-of-course summative surveys. Table 3-1 describes the available artifacts and the alignment of each to research questions and analysis methods.

Table 3-1. Alignment of research questions to data sources and analysis.

Research Question	Data Sources	Data Analysis
1 How does Ewits strive to help women overcome barriers to entry into technology entrepreneurship?	Program artifacts Organizer Interviews	Descriptive statistics Case description Content analysis Thematic coding
2 What impact does Ewits have on participants' entrepreneurial attitudes and intentions?	Applications Follow-up Surveys Interviews	Inferential statistics Thematic coding
3 How do participants describe their experience with entrepreneurship?	Interviews	Thematic coding

To answer RQ1, the following artifacts were analyzed:

- Program description and curriculum materials were analyzed to develop an overall description of the program and to understand how the organizers attempted to affect learner's entrepreneurial attitudes and intentions and to address the issues of gender bias and ambient belonging.

- Participant applications (n=283) were analyzed to develop a demographic description of program participants including degree level, prior entrepreneurial experience, and an understanding of why they wanted to participate in the program.

To answer RQ2, the following artifacts were analyzed:

- Learner end-of-course surveys (n=151) were analyzed to establish a baseline understanding of program effectiveness. Participant surveys were collected by program organizers for all five cohorts. They are anonymous and required by all team members before they can enter the investor pitch competition. They include questions about program effectiveness and participant self-efficacy on entrepreneurial competencies. Both quantitative and open-ended qualitative question formats are used.

Phase Two (Semi-Structured Interviews)

During Phase Two, interviews were conducted with program participants representing three different stakeholder perspectives (Organizers, Mentors, and Learners). The interviews are used to develop more in-depth understanding of salient themes that emerged during Phase One. The interviews provide a deeper look at the impact participation in this experiential entrepreneurial educational model had on participants' entrepreneurial attitudes and intentions (RQ2). They also provided insights into how participants constructed their understanding of entrepreneurship (RQ3) including the experience of ambient belonging, socially learned stereotypes, and gender bias. Additional factors and barriers were explored that affected women's participation in entrepreneurial activities (RQ2). By including the perspectives of different stakeholders, the research questions were examined from multiple points of view.

Program organizers provided e-mail and phone contact information for all stakeholders so that potential interviewees could be contacted. All Organizers (n=8) were contacted for participation. The first five to respond were interviewed. For Mentors (n=35) and Learners (n=283), participants were assigned a random number ranking. Mentors and Learners were then contacted in order of random selection until adequate

responses produced the desired number of interviews. Interviews were conducted in-person or via video conferencing. Video conferencing was used to conduct interviews with participants who are not able to meet for an in-person interview. Interviews were conducted using a semi-structured, open-ended protocol (Appendix C). All interviews were recorded and transcribed. Interviewees were allowed the opportunity to review and respond to their written transcript. Some participants used that opportunity to clarify or add to contents of the transcript.

To preserve the interviewee's confidentiality, all interview participants were assigned a pseudonym generated from a random name generator. Table 3-2 provides the interviewee pseudonyms, their career field and/or discipline, their highest degree attained and a brief description of their previous entrepreneurial experience. The stakeholder groups are not noted in this table as it could be used to identify the interviewee, and thus compromise confidentiality. The entrepreneurial experiences noted are those in which the interviewees had actual experience. They include working in entrepreneurial support services, participating as a founder in one or more startup companies, and working as an employee for a startup company. In one case, the interviewee was a long-time owner of a single company (entrepreneur), in another the interviewee had attempted several startup ventures, but none had yet experienced a level of success that allowed her to leave her primary employment.

In total, fifteen women were interviewed. Five from each of the three stakeholder groups of organizers, mentors, and learners. They represent all five cohorts of Ewits participants with four from 2012, two from 2013, five from 2014, two from 2015 and two from 2016. They hold a variety of degrees with four holding doctoral degrees, seven

with master’s degrees, and four with bachelor’s degrees. Their entrepreneurial experience includes seasoned entrepreneurs, early stage startups, entrepreneurial support services, and innovators in larger companies. Their fields of expertise cover a wide variety of science and technology disciplines including engineering, health sciences, business administration and communications.

Table 3-2. Interview Participants, Their Career Field, Highest Degree, and Entrepreneurial Experience

Interviewee	Career Field / Discipline	Highest Degree	Entrepreneurial Experience
Brandi	Communications	PhD	Support Services
Deborah	Environmental Engineering	MS	Multiple startups
Gretchen	Computer Science	MBA	Multiple startups
Harriet	Business Administration	BS	Startup employee
Jan	Journalism	MBA	Support services
Julia	Biology	BS	Multiple startup attempts
Kim	Health Science	MS	Startup employee
Monique	Communications	MS	Startup
Nadine	Political Science	PhD	Technology Startup
Natalie	Molecular Biology	PhD Candidate	Startup employee
Rebecca	Builder / Developer	BS	Multiple startups
Roberta	Marketing	BA	Support services
Rosa	Accounting	MS	Support services
Shari	Biochemical Engineering	MS	Multiple startups
Tasha	Medical	MD	Technology startup

Data Analysis

Procedures

For this article, the program applications, end-of-course surveys, and interview transcripts were analyzed. The program applications and end-of-course surveys from Phase One included both closed-ended quantitative questions and open-ended qualitative questions. All of the data collected in Phase Two was qualitative data. There are several tools used in this analysis. The initial combining of data sets was conducted

using Microsoft Excel. Qualtrics was used to capture the data from the paper surveys. Quantitative data analysis was conducted in R Studio v 1.0.126 using R x63 3.3.3 and RMarkdown v 1.3. Qualitative data analysis was conducted in NVivo 11.4.0.1062 using thematic coding and text analysis.

Phase One Analysis

Before beginning statistical analysis, the datasets from cohorts 2013 – 2015 were combined into a single file and the data tidied. The initial combining of data sets was completed using Microsoft Excel. The data tidying and quantitative statistical analysis was conducted using R. The final data sets have been cleansed to remove all identifying information so it is an anonymous data set for analysis. All participant identifying information and references to program name and university are anonymized. Learners and teams were given random identifiers so that the Learner relationship to Team assignment is retained, but the identifying information is removed. The resulting data frames were stored for use in data analysis.

Learner application

The program applications include both close-ended quantitative and open-ended qualitative questions. The responses provided by Learners on the program applications were combined with information tracked by the program organizers about Learner acceptance, attendance, and completion. Data from cohorts 2013 – 2016 were combined in a single data set for analysis. This provided the ability to compare results for the entire program, by cohort and within cohorts. The data were analyzed using summary statistics providing an overall description of both the program applicants and the demographics of the Learners. The open-ended questions were exported into a text file and uploaded into NVivo for analysis.

The application was conducted as a paper and pencil application in 2012 and then as an online survey application in 2013 - 2016. The online application contained the same question set as was included on the paper application. A copy of the original printed application is included in Appendix A. Unfortunately, the program organizers were unable to locate the paper applications for the 2012 cohort. Some 2012 participant data was collected from other program documentation to provide as complete of a data set as possible.

The data analysis was completed using the combined tools of Microsoft Excel and R-Studio. Before beginning the analysis, the data was combined into a single data set containing the responses from the 2013 through 2016 cohorts. Each applicant was assigned a random identifier and all personally identifiable information was removed from the dataset. The anonymized application data set was stored in the Applicants.csv file. To begin the analysis, the anonymized application data set is read from Applicants.csv and assigned to the Applicants data frame. The Applicants data frame was then filtered to extract the rows corresponding to only the learner data and create the data frame Learners. Learners are defined as the applicants who accepted the invitation to attend the program, attended at least one session, and were assigned to a project team. The Learners data frame is used for all data analysis after the initial Application Decision table is created. This focuses the application analysis on the responses from learners who participated in at least one session of the program.

Learner end-of-course surveys

End-of-course surveys were conducted for all five cohorts. The surveys are anonymous, so cannot be connected to individual learners. However, they do include a question to indicate which team the Learner was assigned to. The end-of-course

surveys for cohort 2012 are missing from the collected data set, so this analysis includes responses from 2013-2016 cohorts. The program organizers designed the questions which were updated each year before administration of the survey. Learners were required to complete the survey prior to entering the investor pitch competition. Theoretically, all Learners completing the course should have completed the survey. But the number of surveys available (n=151) were smaller than the number of participants who were designated as completing the course for cohorts 2013-2016 (n=170).

The End-of-course Surveys for cohorts 2013-2015 were provided in the form of scanned copies of the paper surveys. A copy of the End-of-course Survey from the 2015 cohort is included in Appendix B. To prepare the data for analysis, Qualtrics surveys were developed that matched the items in the paper surveys and all surveys were manually entered. The paper surveys were numbered 1-n and this number was recorded as one of the variables in the data set. This allowed validation of data against the paper survey if needed. The end-of-course survey for cohort 2016 was conducted using Survey Monkey and results were provided in electronic format. The data from all four cohorts was merged into a single dataset so that analysis can be run within each cohort and across cohorts. Since there were small adjustments to the survey each year, this required a bit of data manipulation to prepare each year's data set for merging. See "Tidying the Data" in Appendix D for more information on how this dataset was merged and prepared for analysis.

The end-of-course surveys included both closed-ended quantitative questions and open-ended qualitative questions. The quantitative questions on the end-of-course

Survey are ordinal Likert scale and multiple-choice questions. The qualitative questions are open-ended response. The qualitative questions are often attached to an ordinal response question allowing a more detailed response. There are a few standalone open-ended response questions at the end of the survey. The survey questions evolved slightly over the years with additional questions being added in 2015 and 2016. Most of the quantitative questions used ordinal or Likert scale ordinal responses. All quantitative data were analyzed using descriptive statistics, analysis of variance and inferential statistics. The analysis was completed in R-Studio using RMarkdown with a variety of R packages which provided both numeric and ordinal analysis techniques. The qualitative open-ended questions were exported and analyzed thematically in Nvivo. The results are presented as an overview of emerging themes with a sample of representational answers.

The analysis procedures for the Likert and Ordinal scale questions is based on "Descriptive Statistics for Likert Data," *Summary and Analysis of Extension Program Evaluation in R* by Salvatore S. Mangiafico (Mangiafico, 2016). The Likert scale questions in this data set all use five-point scales. Most of them use the scale (1=poor, 3=average, 5=excellent). The scale responses are symmetrical in that there are corresponding options for both positive and negative responses, surrounding a neutral response. Some of the questions include an opt out (N/A) response. The analysis of Likert scale questions included individual question by question analysis and grouping of related items to develop an overall measure. For example, questions about the effectiveness of program elements were individually evaluated and then combined to

obtain an overall rating of effectiveness. This overall score can then be used to highlight elements that were either above the overall mean or below the overall mean.

One consideration when evaluating Likert scale data is whether to treat the data as ordinal, interval/ratio, or numeric data. While there is some controversy about which is more accurate (Boone Jr and Boone, 2012, Norman, 2010) evaluating the data as numeric gives the option to use a variety of statistical analysis techniques and evaluating as ordinal allows for the creation of useful data visualizations. One argument for treating the data as ordinal data is that it is often unclear whether the space between each selection item is equal, or if respondents consider the space between “average” and “poor” the same as the space between “average” and “excellent,” or whether “poor” and “excellent” can be averaged to equal “average?” There are also constraints on interval ratios in that Likert data are not necessarily continuous and do not allow for midpoint or off scale responses. Ordinal data can be evaluated using nonparametric tests including bar graphs, medians, and ordinal regression. Treating Likert data as numeric data allows the use of parametric tests such as t-tests and ANOVA, and allows for reporting of means. While some may attempt to challenge the use of parametric tests on Likert scale data, Geoff Norman (2010, p. 631) showed that parametric tests “can be used with Likert data, with small sample sizes, with unequal variances, and with non-normal distributions, with no fear of coming to the wrong conclusion.”

The following R packages were used in this analysis.

- The likert package provides tools for analyzing and visualizing Likert scale results.
- The ordinal package allows for analysis of Likert data as the dependent variable in ordinal regression.

- The FSA package provides a Summarize function which provides summary statistics for a factor variable.
- The psych package provides a general-purpose toolbox for working with both ordinal and numeric data.
- The lattice package provides additional graphs and visualization options for multivariate relationships.
- The rcompanion package provides a groupwise median function to calculate medians and confidence intervals for one-way or multi-way data.

Phase Two Analysis

The Phase Two data collection includes 15 semi-structured interviews as well as the qualitative feedback from the open-ended questions on the applications and end-of-course Surveys. This section summarizes the analysis procedures, provides a description of the interview participants, and presents the coding methods and codes used in the qualitative analysis. To preserve the anonymity of all respondents, any identifying information in the transcribed data is blacked out when reporting the findings from this study. This blacked out data can include names of participants, names of companies, organizations, or university affiliations.

Participant interviews

Interviews were conducted either in the interviewee's office, a local coffee shop, or via video conferencing. Three of the fifteen interviews were conducted using Zoom teleconferencing, the remainder were conducted in person. Each of the interviews were recorded using duplicate recording methods to ensure there was no loss of data due to technical difficulties. One recording was captured using a LiveScribe pen which allowed correlation to notes taken during the interview. A second recording was captured using a cell phone app. For the videoconference interviews, zoom was used along with the built-in recording function. The resulting recordings were uploaded into secure cloud

based storage. The duplication of recording proved a beneficial safeguard as two interview recordings were lost due to technical failures. In both cases, the backup recording prevented the loss of audio data.

Qualitative analysis

All qualitative analysis was conducted in NVivo using thematic analysis. Both open-ended qualitative questions from the applications and end-of-course surveys were analyzed along with transcripts from the semi-structured interviews. Text from open-ended questions were exported into text files and uploaded into NVivo. Interviews were recorded using an audio recording device. They were then transcribed and shared with the interviewees for additional input. Two interviewees provided updates and edits to their transcripts. The updated interview transcripts and audio files were imported into NVivo for analysis.

All qualitative data were analyzed and coded thematically using NVivo (Seidman, 2013). The coding process included several rounds of review. An initial code book was developed from themes arising from the literature review. The first step of coding involved aligning the written transcription to the audio recording so that the audio could be listened to while coding the written transcription. The written transcripts were then coded while listening to the audio. This step was very helpful in allowing the researcher to listen to the interview in the voice of the interviewee, as well as to ensure the written transcription was accurate.

During the first pass through the interviews they were coded using four broad categories 1) Background, 2) Entrepreneurial Experience, 3) Ewits Experience, and 4) Gender Related Experience. The coding reports were reviewed and seven emerging themes were identified. They are 1) Role Models, 2) Entrepreneurial Identity, 3) Mentor

and Team Dynamics, 4) Empowerment, 5) Do the Work, 6) Safe Environment, 7) On-going Support. During subsequent passes, the coding was updated to ensure these emerging themes were captured. The coding reports were reviewed again, refining the coding alignment and narrowing the focus on the text of the interviews, eliminating unneeded information (Seidman, 2013). Table 5 lists the themes that emerged, the total number of references identified from all interviewees, and the total number of interviewees who discussed each item. After coding the interviews, the qualitative answers were revisited from Phase One. These answers were then coded using the code book developed for the interview analysis.

Table 3-3. Themes and number of references for each theme

Theme	Total Number of Participants Who Discussed each Theme	Total Number of References from all Interviewees
Significant Role Models	15	Entrepreneurial: 12 (80%) Female: 9 (60%)
They are empowered	10	14
Entrepreneurial Identity	15	16
Mentorships and team relationships	12	25
They have to do the work	8	13
Ewits as safe space	7	8
They want more ongoing support	5	15

Limitations and Assumptions

Perspectives of the Researcher

One of the basic tenants of a feminist epistemology is that the researcher is integrally involved and co-constructs knowledge along with the research participants and the cultural environment. As the researcher, my current knowledge about these issues has evolved over time. They are influenced by my experiences as a female working in the information technology (IT) field and as a co-owner of a feminist

bookstore. My experiences as an IT professional and as a feminist bookstore owner provided me with firsthand knowledge of many of the issues that are discussed and analyzed in this research. These perspectives evolved as I enhanced my knowledge through review of research on these topics. In addition, I participated as a mentor in the 2014 cohort of Ewits and as a mentor's mentor in the 2016 cohort of Ewits. This direct participation in the program allowed me to situate myself within the context of the research and gain efficacy with the program participants. In addition, I was able to see and experience the process both working on a team and in supporting other mentors as they experienced the process. I recognize that my perspectives are my own and may be different from others who have had similar experiences. The researcher acknowledges and continues to be aware of issues of privilege and the sociocultural paradigms and constructs that affect biases.

Intersectionality

Women differ in many ways including race, gender expression, age, background, and culture. While this paper focuses on the effects of gender on women's participation in entrepreneurship and technology, it is important to acknowledge that there are many intersecting influences on how women approach their lives and their careers. It is not the intent of this research to ignore the other diversity issues that so desperately need attention. While this study looks at the rates of female participation in technology and entrepreneurship, the rates of minority participation in these fields are also of concern. Throughout this report, both gender and racial diversity data are presented to gain a full understanding of the issue of diversity in these fields. What this research discovers about how women succeed as "the other" in a masculine-gendered field may also apply to other underrepresented minorities. The experiences and barriers faced by women

may be different, but the paths through these obstacles may be similar. The support structures needed to overcome gender bias and stereotype threat are the human issues of respect, mentoring, and access which comes relatively easily to individuals who have been privileged as the majority representation of success.

Population Bias

The population studied in this research is a highly-privileged population. They are highly educated and have many resources available to them. All the women who participated in this program self-selected and indicated prior interest in entrepreneurship. What was learned from this population may not be generalizable to the general population. Additional research is being conducted on a parallel program which targets a more broadly diverse, less affluent, and heterogeneous gendered group. The results from this study can be compared to the results from the parallel program to determine how the female-only program compares in its effectiveness.

Summary

This study uses a mixed-methods methodology with a case study approach to examine how this all-female model of entrepreneurial education affects participants' entrepreneurial competencies, attitudes, and intentions. The research design, context, participants, data collection procedures, data analysis procedures, and the study's limitations were explained. Chapter 4 will include findings from both the quantitative and qualitative portions of the study.

CHAPTER 4 RESEARCH FINDINGS

This chapter presents Empowering Women in Technology Startups (Ewits) as the focus of this case study. The experiences of organizers, mentors and learners who participated in the program were reviewed, based on the analysis of documents, survey, and interview data. After presenting the program's mission, curriculum, organization, and participant groups, the chapter discusses the program's impact as reported by learners and mentors. The chapter will conclude by highlighting the ongoing support needs as expressed by the learners and other participants.

EWITS

Empowering Women in Technology Startups (Ewits) is an entrepreneurial education program designed to help women learn about the technology licensing process and gain the self-efficacy to succeed in technology entrepreneurship. The program focuses on “barriers to entry for women (work/life balance choices, self-confidence, lack of training, lack of mentor network, waiting to be asked) and strategies for overcoming them” (Ewits, 2017a, p. 3). They do this by providing educated women with hands-on entrepreneurial training and skills that will empower them for the rest of their lives (Ewits, 2017a). “Many think of entrepreneurs as business people, but entrepreneurs come from all walks of life” (Ewits, 2017b).

Central to Ewits is the authentic simulation “focusing on researching and understanding the commercial opportunity of an innovation.” This experiential learning approach immerses the learners and mentors in a realistic process of creating “company elements needed to move an innovation from the laboratory to the marketplace in a simulated environment.” The team and mentoring process is central to

this approach, providing “a chance to network with successful female entrepreneurs, business leaders, and investors,” including, “mentoring by experienced women entrepreneurs and professionals,” and “a chance to be part of a team comprised of highly-educated professional women.”

The mission and vision of the program consist of the following:

- **Mission:** To educate, inspire, and empower women to pursue leadership roles in technology-based companies worldwide.
- **Vision:** A world in which gender issues are neutralized.

The program was conceptualized by Jane Muir and her team in the Office of Technology Licensing (OTL) at the University of Florida Innovation Hub as an effort to increase the number of women who were participating in the university technology transfer process.

Jane Muir, the founding organizer, tells the story of the beginnings of Ewits:

I started doing brown bag lunches with a few of my team members and said, “Hey, we need to do something about this [low participation of women]. What can we do?” So, we had a number of those where the conversation went from, you know, what can we do about this? [...]. And at some point, I said, none of us have the bandwidth to take all this on, so we need to look at what our core competencies are, what’s synergistic with the mission of the HUB and so that we can justify allocating resources and where we can really have the biggest impact using the limited resources that we have. And believe it or not, we created that program and had it running – [...] in either three or four months’ time – we had over 50 people in that room and we were just rocking it. (2016-11-18)

Since 2012, Ewits has been offered annually to cohorts of women interested in learning more about technology commercialization.

Program Description

Ewits is organized as a 10-week educational program with a content component (two-hour educational sessions) and a culminating investor pitch competition where

teams present startup plans to an all-female panel of angel and venture capital investors. The participant handbook describes the program as:

Ewits® is an experiential learning program designed to provide educated women with an introduction to the processes required to form a startup venture and develop a commercialization strategy for cutting-edge, innovative technologies developed at research universities. Each week participants hear presentations on various aspects of technology commercialization and business planning from experienced, successful women entrepreneurs. Participants work in teams, and each team is assigned a specific technology. Each team is also led by an experienced woman entrepreneur or business leader who serves as the virtual CEO/mentor and guides the creation of a business plan for developing and commercializing the technology and an investor presentation. There are no exams or grades. Business plans and investor presentations are judged by a panel of women investors with recognition and awards presented to the winning teams during the last session of the program (Ewits, 2017a) .

Prior to each session, the program organizers select a variety of technologies from the OTL, and recruit experienced entrepreneurial mentors and female leaders who will serve as the “Virtual CEO” for the program’s start-up teams. As specified in the *Training Manual for Program Coordinators (Ewits, 2015)*, “Mentors MUST be successful entrepreneurs that an OTL would trust with commercialization of one of its technologies.” The mentors then participate in a mentor training which includes information about the program, guidance on how to effectively mentor their teams, and a review of technologies available for the program. The mentors then review the available technologies and make recommendations for which technologies to choose for the program. During this time, the organizers are hosting a series of informational sessions designed to recruit learners for the program. Learners then complete a program application which is reviewed by the organizers to ensure the learners have the background and desire to be successful in the program.

The first session of the program is a mentor/technology matching session where the learners and mentors participate in a speed-dating style process designed to introduce learners to the mentors and their selected technologies. The learners then rank their preferences both for technology and mentor matching. Over the next week, the organizers work to assemble the program teams, taking into consideration the learner's preferences but also trying to create teams that have a balance of scientific, technical, marketing, financial, and other expertise. During session two, the mentors and learners receive their team assignments. They work with this same team, mentor, and technology throughout the entire program. Each team is assigned a color and the teams are referred to by their color (i.e. "Blue Team") throughout the remainder of the program. They are provided with t-shirts matching their assigned color to wear during the investor pitch competition at the end of the program.

The weekly sessions start with an educational component, followed by a team work session. The sessions begin with a presentation from a successful female entrepreneur or innovator. These presentations usually consist of an overview of their entrepreneurial experiences including a discussion of barriers, challenges, or gender biases they have experienced in their careers and leadership roles. These presentations often serve as catalysts for in class discussions. The sessions then present an informational topic related to the startup process. The informational topics were video recorded in advance by a variety of entrepreneurial experts including experienced entrepreneurs, entrepreneurial support professionals, and consultants.

The final week of the session is an investor pitch competition. During this competition, one member of each team presents their startup plans to an all-female

panel of angel and venture capital investors. One week prior to the competition, the teams submit their business plans for judges to review and score. Immediately after the investor pitch, the judges give the teams direct feedback on both their presentation and their business plans. The investor pitch and business plans scores are tallied at the end of the competition, and First, Second, and Third place winners are announced. There are prizes for the winning teams, often including iPads for the first-place winners.

During the program learners work together to research the technology, write a business plan, and prepare an investor pitch presentation. The mentors and learners are advised that this program is an instructional simulation and that business plans they are conceptualizing are not intended to be real business startups. As such, they are given the leeway to be creative and make educated assumptions about their technology and startup that are based on market research, but cautioned not to get too bogged down in the research and technical issues. The mentor's role is to guide the team through the technology exploration process, business plan, and investor pitch development. The teams and mentors sit together during the weekly instructional sessions and work together afterward to apply the day's topic to their technology startup plans.

To support these activities, the program offers eight weekly instructional sessions that cover topics related to technology licensing and the business startup process. These activities include value propositions, forming the management team, market analysis and strategy, commercialization strategies, intellectual property, financials, corporate structures, sources of funding, business plan development and company presentations. The program organizers originally designed the curriculum in conjunction

with Subject Matter Experts (SME's) who had expertise in each of the topics. The SME's then video recorded their presentations so that they could be played during informational sessions and be made available online via a learning management system (LMS).

Additional educational curriculum is available online in an LMS, including a program handbook, articles and content related to technology licensing and the startup process, business plan examples and templates, and financial spreadsheet models. Mentors and learners have access to the University of Florida library and research resources throughout the duration of the program. During one of the weekly sessions, licensing officers from the Office of Technology Licensing come in to talk with the teams about their technologies and answer questions about the status of the technology and the licensing process.

Ewits Participants

Early in the analysis, it became apparent that the women associated with this program, regardless of their roles, described a dynamic process of learning and growth associated with their participation. To honor this shared experience, all the women involved in the program are referred to as participants. Four distinct categories of stakeholders were identified within the program participants. They were: 1) Organizers, 2) Subject Matter Experts, 3) Mentors, and 4) Learners.

Organizers and subject matter experts

The *Organizers* included six women who worked in the technology licensing office, the UF Innovation Hub, and in various aspects of technology entrepreneurship who originally envisioned the need for the program and took part in the design and implementation of the program and curriculum. In addition, two additional women who

worked with the program as facilitators, managing the daily program, and coordinating the informational sessions were also considered Organizers.

The *Subject Matter Experts (SMEs)* were successful entrepreneurs, venture capitalists, and angel investors. They came from both inside and outside of the local area to serve as presenters and judges. They helped with the development of curriculum, recorded video presentations, presented during the course, reviewed business plans, rated investor pitches, and gave feedback to the learner teams. It was a bit more difficult to determine the exact number of SMEs who participated in the program over the five cohorts; however, there were at least forty documented in the program records. There may have been others who participated as presenters, or who reviewed curriculum and provided support to teams that were not recorded in the program records.

Mentors

The *Mentors* consisted of successful female entrepreneurs and businesswomen from the local community with a wide variety of expertise in startup companies, venture capital financing, and financial management. The organizers recruited them to serve as CEO's for the mock startup companies. There were a total of thirty-five mentors who participated in at least one cohort. To date, only three of the mentors have participated as a mentor in more than one cohort. After feedback from the first two cohorts, the organizers added a mentor's mentor, sometimes called a roving mentor, to provide support to the mentors and to fill in when a mentor was absent. The roving mentor sits in with teams whenever their mentor is absent during one of the informational sessions. The roving mentors were selected from among the most successful mentors in previous cohorts and were available to meet with mentors as they prepared to enter the program,

giving them guidance, and helping to pass along many of the lessons learned and best practices from previous cohorts.

The end-of-course Surveys include several items intended to give program organizers feedback on the mentor relationship as well as on the overall effectiveness of the mentor-team collaborations. Three Likert-Scale questions address the mentor relationship: 1) Knowledge: How would you rate your mentor's knowledge regarding entrepreneurship? 2) Accessibility: How would you rate your mentor's accessibility outside of the scheduled program meeting hours? 3) Overall: How would you rate your mentor overall? The response options are scaled as 1=poor and 5=Excellent. In addition, there is an open-ended response question which asks, "Please provide any additional feedback regarding the mentorship experience."

Overall the mentor - team relationship feedback is positive. Figure 4-1 shows that the mentor feedback overall is 90% above the average scale of "3", with knowledge at 89% above average, and accessibility at 80% above average. When the feedback data are analyzed by team, we can see variations among teams. Using a combined mean score for all responses, we see a range of 3.6 – 5.0 among all teams. Analysis of variance shows that both team and cohort have a significant relationship to mentor feedback scores, with an F-value for cohort of 3.28, and an F-value for team of 1.74 at a 95% level of significance. This would imply that learner experience may be affected by the mentor – learner relationship, team dynamics, or other effects attributable to the cohort that they participated in.

There were 78 responses to the open-ended feedback question, with 78% of them being positive and supportive of the mentor experience. The negative responses

(22%) focused on a variety of issues including perceptions of the mentor's technical knowledge, time availability, and or guidance to the team.

One example of a positive comment from the 2015 end-of-course Survey is:

Our mentor was great; she kept us focused and many times used her experience to keep us on track. The process was made easier with her feedback. She often steered us away from getting bogged down in details. We all enjoyed working with her.

In this response, the learner is validating that her mentor was effective in guiding the collaborative team process. She helped to guide them and keep them from getting bogged down in the details.

An example of a negative comment from the 2016 end-of-course survey is:

Our mentor was extremely knowledgeable and helpful regarding the technology licensing process and our chosen technology - but was not strong as a leader or facilitator for our team's activities. She was often not present during weekly Ewits meetings, and (with one exception) did not join us for meetings outside of regular session hours. There was very little monitoring or guidance of our progress, and our group's work was very chaotic.

In this response, the learner acknowledges that their mentor is knowledgeable and helpful, but that her absences made it difficult to benefit from her guidance. This caused the learner to perceive the process as chaotic. In later cohorts, Ewits implemented an adjustment to the program where they utilized roving mentors. These mentors were selected from mentors who participated successfully in an earlier round of Ewits. They provided guidance to current mentors, and were available to serve as substitute mentors when a mentor was absent from one of the weekly sessions. This ensured no team would be without a mentor during a weekly session.

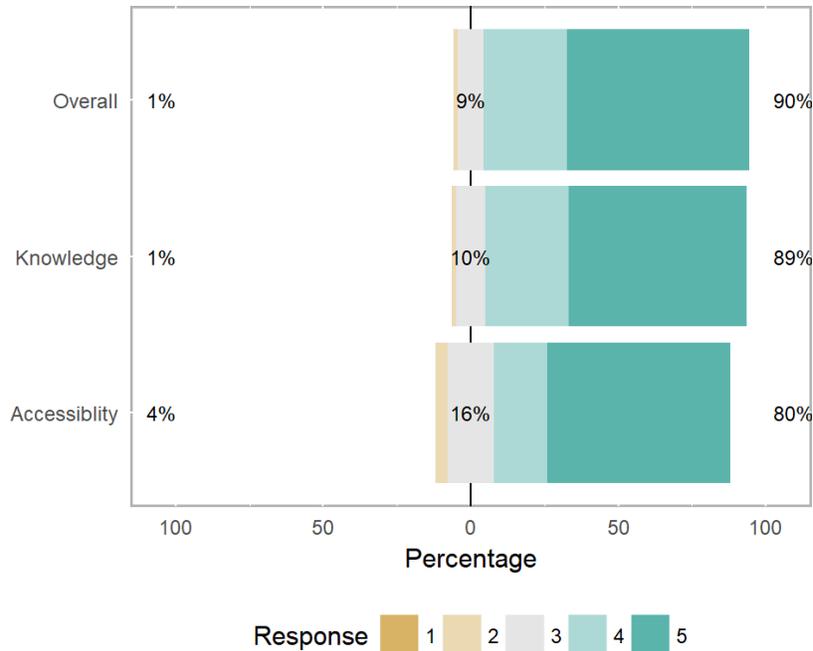


Figure 4-1. Mentor Feedback

Learners

The *Learners* consisted of women who applied and were selected to participate in the program. Most had already obtained college degrees. Many of them had graduate degrees, while some were current graduate students. They made up the team members and founders of the mock startup companies. The learners were recruited through a variety of methods from the university and general community, including a series of information sessions that provided potential applicants with information about the program and an overview of the application process. The program accepted an average of 89% of applicants. Of those who attended the first mentor matching session, a total of 93% completed the program through to the investor pitch competition (Table 4-1). Those who did not complete the program cited a variety of reasons for leaving, including obtaining a new job, moving out of the area, or unexpected family obligations.

According to the learner applications for cohorts 2013-2015 (n=227), 82% of applicants had at least a bachelor's degree (Figure 4-1) and 50% of applicants had a graduate degree or higher. Some were current graduate students; others were business owners, faculty, or women who were interested in the university technology transfer process.

The two reasons cited most as motivation for participating in the program were "Entrepreneurship Training" and "Networking" (Table 4-2). All the learners indicated having access to computers and the internet. They were adept at using a variety of software and technology tools, including statistical analysis software. Less than 8% of applicants reported having any prior exposure to patenting or technology licensing (Table 4-2).

The end-of-course surveys further illuminated traits of the program learners. Table 4-3 provides background information for respondents in the 2015 and 2016 cohorts (the only years this data was collected). The survey shows that the learners come from a variety of disciplines, with 62% of them coming from science and technology related disciplines and 38% of them coming from business or marketing related disciplines. They represented a wide range of ages with about 50% of them being under 35 years of age. The participants were pretty well distributed by racial or ethnic heritage, with East Asian or Asian American being over represented and African American women being under represented. The median household income fell between the \$35,000 to \$49,999 and \$50,000 to \$74,999 groupings.

Table 4-1. Applicant Results by Cohort

	n	Accepted	%Accepted	Attended	%Attended	Completed	%Completed
2012	56	56	1.00	54	0.96	52	0.96
2013	54	50	0.93	47	0.94	41	0.87
2014	52	50	0.96	45	0.90	42	0.93
2015	66	57	0.86	47	0.82	47	1.00
2016	55	55	1.00	46	0.84	40	0.87
Totals	283	268	0.89	239	0.89	222	0.93

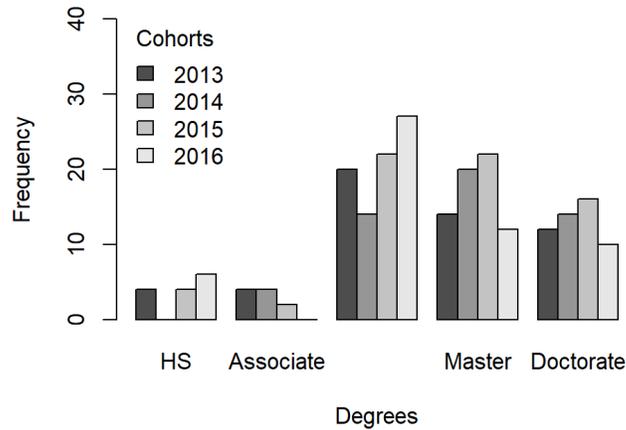


Figure 4-2. Distribution of Applicants by Degree

Table 4-2. Percent of Applicants Who Indicated Source of Motivation

What is your primary goal for participation in the program? (Check All That Apply)	2013	2014	2015	2016	All cohorts
Gain Self-confidence	72%	81%	77%	69%	60%
Start a Company	74%	69%	65%	64%	54%
Networking	80%	83%	85%	82%	66%
Entrepreneurship Training	94%	92%	95%	85%	74%
Attending Seminars/Workshops	61%	60%	61%	58%	48%
Job/Career Opportunities	0%	0%	0%	25%	5%
Valuable knowledge and Skills	0%	0%	0%	51%	10%
Interest in Technology Commercialization	0%	0%	0%	45%	9%
All of the above	44%	52%	42%	38%	35%
Other	9%	6%	5%	0%	4%

Table 4-3. Learner background information for Cohorts 2015 and 2016

What is your area of expertise? (Circle One)			
	Total	2015	2016
Business	13%	12%	14%
Computer/IT	9%	8%	11%
Engineering	17%	10%	24%
Finance	5%	8%	3%
Marketing/Communications/Design	19%	25%	14%
Other	3%	5%	0%
Science	34%	32%	35%

What is your age? (Circle one)			
	Total	2015	2016
18-24	16%	15%	17%
25-34	34%	32%	36%
35-44	23%	22%	24%
45-54	18%	20%	17%
55-64	9%	10%	7%

Circle the answer that best describes your current situation.			
	Total	2015	2016
Married or in a committed relationship with no children	29%	21%	36%
Married or in a committed relationship with grown children (18+)	15%	18%	12%
Married or in a committed relationship with school aged children (5-18)	12%	13%	12%
Married or in a committed relationship with younger child/REN (under 5)	5%	8%	2%
Single parent with grown children (18+)	1%	0%	2%
Single with no children	38%	39%	36%

Which of the following best represents your racial or ethnic heritage?			
	Total	2015	2016
Black, Afro-Caribbean, or African American	5%	6%	5%
East Asian or Asian American	11%	6%	15%
Latino or Hispanic American	14%	9%	20%
Middle Eastern or Arab American	3%	3%	2%
Non-Hispanic White or Euro-American	61%	69%	54%
Other	4%	9%	0%
South Asian or Indian American	3%	0%	5%

Table 4-3. Continued

What was your total household income before taxes during the past 12 months?			
	Total	2015	2016
Less than \$25,000	22%	23%	21%
\$25,000 to \$34,999	4%	3%	5%
\$35,000 to \$49,999	11%	13%	10%
\$50,000 to \$74,999	17%	17%	17%
\$75,000 to \$99,999	17%	17%	17%
\$100,000 to \$149,999	19%	20%	19%
\$150,000 or more	10%	7%	12%

Please circle the option(s) that best describe(s) your current situation. OK to choose more than one if applicable.			
	Total	2015	2016
Employed at a non-technology non-startup company	7%	0%	12%
Employed at a non-technology startup	11%	6%	14%
Employed at a technology non-startup company	12%	16%	10%
Employed at a technology startup	7%	6%	7%
Master's student	11%	9%	12%
MBA student	3%	3%	2%
Owned my own non-technology business	3%	0%	5%
Owned my own technology business	12%	19%	7%
PhD student	11%	3%	17%
Postdoc	12%	19%	7%
Unemployed (not a student)	5%	6%	5%
Work part-time (not a student)	1%	0%	2%
Work part-time (not a student)	5%	12%	0%

Entrepreneurial Identities And Role Models

The interviewees were representative of the broader participant population as well. As noted in chapter 3, those who were learners in Ewits were well educated (50% graduate degree) and had some entrepreneurial experiences ranging from support services to multiple start up experiences. The interviews revealed two common experiences among the fifteen interviewees, regardless of their role. First, they have strong entrepreneurial and innovator identities. Second, they can describe at least one significant role model which gave them a first exposure to entrepreneurship or to a strong female leader.

Entrepreneurial Identities

Each of the interviewees had a story about a person or an experience that they can point to which introduced them to entrepreneurship. Twelve of the participants described a previous experience with entrepreneurship, either through a close family member or friend who was an entrepreneur or an experience in providing support services to startup companies. Regardless of their current role or position, the interviewees described themselves as innovators who were involved in the process of making something new happen. Natalie stated:

So, the company I work in currently, we are a small innovative arm. So, a lot of what we do – I play a pretty big role in launching new products, thinking about new products. So even though I'm working for a larger company, under our parent company, we still have pretty innovative roles.

Natalie's entrepreneurial identity was integral to her work as she plays a leading role in creating products and bringing new products to market. She sees herself as an innovator within a larger company.

The participant, Deborah, talked about her entrepreneurial identity from the perspective of wanting to make something happen.

And it's not that I really thought about, "Hey, I want to be an entrepreneur because that's a cool sexy thing." It's just like, "I have this thing and I want to see this thing happen." And my two things that I've been trying to do as an entrepreneur, they're so completely different. They're two different sides of – one's more designed and the other one is more engineering. One's definitely a lot more scientific than the other.

For Deborah, being an entrepreneur is connected to changing the world and is not limited to only one dimension but brings together her interest in design and engineering.

By contrast, Julia struggled a bit more with her entrepreneurial endeavors, yet she still maintained a strong entrepreneurial identity. She claimed, "This is for me," and

added, "I'm still pursuing some technology ventures and some small business ventures as well, that I want to incorporate some technology in."

Role Models

All fifteen of the interviewees describe significant female or entrepreneurial role models who inspired them to succeed in their careers and as entrepreneurs. Nine of them described a strong female role model – a mother, grandmother, aunt, or other close family member who influenced how they saw themselves as a scientist, a technologist, or an entrepreneur. Twelve of them described someone in their close circle of family or friends who was an entrepreneur. Four of them describe working in a family business that gave them their first hands-on experience with entrepreneurship.

Nadine talked about her father and godparents who were all entrepreneurs:

My dad owns a number of rental properties, and then my godparents, they retired when they were 40. They were double income, no kids, making really nice salaries. [...] I saw that, and I also saw the flexibility that owning your own business afforded them. They could travel wherever. They had a few months where they would just hunker down, and do a lot of their inventory, and all that kind of stuff. And he could work anywhere, really. So, I saw that, and that was also interesting. I thought about, "What could I possibly do?"

Like the other interviewees, Nadine grew up seeing adults engage in entrepreneurial activity and saw first-hand the benefits that this brought ("nice salaries," "flexibility").

Harriet described her mother as a role model and the experiences she had a result of working in her mother's business. She stated:

My mother owned a very large marketing communications business. She did all of the franchising in the early days of the [REDACTED]. It was not unusual for our family to have very high-level executives at our dinner table on a regular basis – because we operated the business 24/7. I entered that business in college and I worked for her, and I did all the

billing for the company and a variety of things. I did market research for companies like [REDACTED]. So, I entered the entrepreneurial environment at a very young age because that was our life.

Even though Harriet is not currently working for an entrepreneurial venture, she saw these experiences as shaping who she is as a female professional as well as her personal entrepreneurial identity. She stated, "I think that's a result of growing up with a person like I did, my mother, who really set the bar at a very high level."

It is interesting to note that several of the interviewees did not immediately recognize these role models. For example, when Natalie was asked if anyone in her family, or close network of friends was an entrepreneur, she initially replied in the negative but then observed that her mother operated her own business from their home,

No. No. But, my mom, [REDACTED], she had her own business. [...] where she would make, I don't know, binding of books and printing, printing fliers, more like graphic design, so doing commercials – it was like a spare room in my grandfather's house, and it was facing the street. So, she just opened that space and did it.

Natalie went on to talk about how that experience affected her perception of entrepreneurship. "But it was really tough. Securing the income, the customers, having the clients, [...] having a constant source of income." But she also saw that it was rewarding. She spoke fondly about the relationships her mother developed with her clients. "That's one of the things that I like seeing, and she was very happy about it."

When asked about role models, Gretchen also replied in the negative. "But I didn't have any strong – I don't recall having – besides my family just saying, "Yeah, go be an astronaut." But it wasn't strongly..." Later in the interview she tells the story of her mother who "founded the first Women's Flying Club at [REDACTED]." She says, "I was three, and so she put me in the back seat with a coloring book and crayons [...] while she is in the front seat practicing touch and goes." Gretchen realized at that

moment that her mother was a strong female role model. She emailed several weeks later to share the following statement:

It's interesting that after we talked I hadn't realized how novel my childhood was and my parents' contribution to my interests in science – a telescope when I was 9 was my prized Christmas present and I never realized how unique that was! I want you to know that I wrote a thank you note to my mom right after that!

Participants' Experiences in Ewits

The analysis of Learner survey data and the interviews with learners, mentors, and organizers led to three motifs. First, the analysis demonstrated that participants in Ewits shared certain experiences that facilitated their engagement with the program. Second, participants described the impact of the program in terms of competence, empowerment, and awareness of gender bias. Third, two key conditions that made a difference per the participants were that Ewits created a safe space to explore gender inequities and that the program provided mentorship to help them navigate the process. Each of these motifs is described in detail below.

The Reported Impact of Ewits

All participants who were interviewed described Ewits as an experience that empowered them. It was not just the learners who described this empowerment, but also the mentors, the organizers, the presenters, the judges, and everyone else who had in some way been involved with the program. Empowerment emerged in three ways throughout the data: (a) the development or validation of the competencies necessary to patent, license, and launch a startup and an understanding of challenges for entering leadership positions in technology startups as women; (b) increased entrepreneurial intention and (c) a greater awareness of the effects of the gender-related issues in the field.

Competence building and validation

Ewits aims to impact learners' confidence in the competencies associated with technology startups and the perceived challenges to entering technology entrepreneurship. It accomplishes this through the educational content presented at the informational sessions as well as the constructive and collaborative learning that occurs when the teams research their technologies and prepare their business plans and investor pitches for their technology startups.

Learners describe gains in their personal understanding of entrepreneurial competencies. The end-of-course survey provides insights into the learners' perception of changes after participating in Ewits. Learners were first asked to rate their skill levels before attending Ewits; then they were asked to rate their skill levels after participating in Ewits. The difference between these two levels was quite significant as can be seen in Figure 4-3. For example, Learners rated their knowledge of commercialization before attending as 70% below the midpoint, 21% at the midpoint, and 9% above the midpoint. After attending Ewits, their perceived understanding of commercialization was 9% below midpoint, 29% at the midpoint, and 62% above the midpoint. These data show that learners reported an increase in their personal understanding for each of these five areas because of their participation in Ewits.

A second question on the End-of-Course surveys addresses perceived challenges to assuming leadership positions in technology startups (Figure 4-4). Learners were first asked to rate their perceived challenges before attending Ewits; then they were asked to rate perceived challenges after participating in Ewits. Again, we can see that the Learners reported positive impacts on their personal perceived challenges. For example, Learners rated Role Models as 36% above the midpoint before attending

Ewits, and 79% above the midpoint after attending Ewits. This data shows that learners feel Ewits helped mediate perceived personal challenges to taking on leadership roles.

The interviews and short-answer items on the End of Course survey confirmed and further expanded on these patterns. The following comments were taken from the End of Course survey.

Ewits was a great opportunity for me to validate that I have the necessary technical skills to take a patent and create a product. It also helped me to visualize my strengths and what things I need to work on in order start my own business.”

Said another learner:

It was very validating for me. I realized I have much more skill and business knowledge than I thought I had. I am now contemplating starting a conference to tackle this issue. I would not have done that prior to EWITS.”

These comments show how the program provides an explicit validation of technical skills (competencies) that these two women had not necessarily experienced previously. For the first learner, it was the ability to patent and start a business. For the second learner, it was a validation of her business knowledge. Both women also note how the program helped them take initiative and take ownership (challenges) of their own professional development. In addition, they both described an intent to launch a startup or a new venture (entrepreneurial intention).

Similarly, Nadine talks about her own increased confidence, as well as the validation of feedback from her mentor. She says:

I think that my work or my participation in Ewits [...] gave me a good amount of confidence that the work that I contributed to our project was sound because we had tons of feedback from our coach. And so, that was just another big confidence builder that I could do work that would help this product potentially go to market.

Her comments showed that she both valued the feedback from her mentor, and felt she had confidence in her ability to prepare to launch a technology startup. All three of these interviewees validated the data on the End-of-Course surveys by confirming that they either developed or validated the competencies associated with technology startups, as well as developed the confidence that they could launch a startup.

Q: Please rate the following benefits/skills/knowledge levels in terms of how much you feel your participation in the Ewits program has impacted your personal understanding for each area. (Circle one for each category. Scale 1=poor, 3=average, 5=excellent)

- Commercialization: The technology commercialization process
- Research: How to conduct market research
- Plan: How to write a business plan
- Presentation: How to develop an investor presentation
- Funding: Funding sources for startup businesses

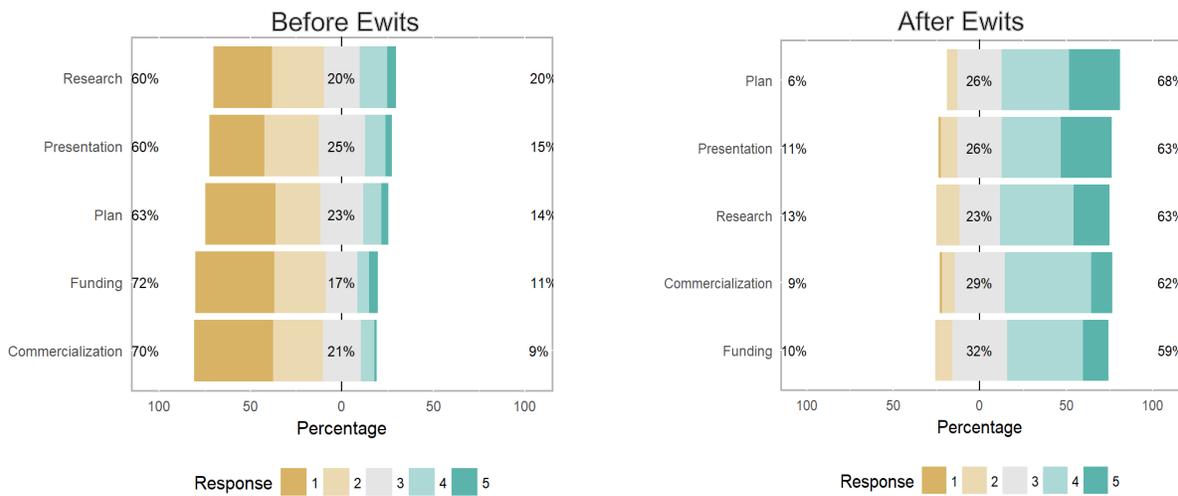


Figure 4-3. Self-reported impact on perceived competencies before and after Ewits

Q: Research identifies various barriers to entry for women in assuming leadership positions in technology startups. Please rate the following in terms of how much you feel your participation in the ewits® program has impacted your personal perceived challenge(s). (Circle one for each category. Scale 1=poor, 3=average, 5=excellent)

- Support: Support Systems (mentoring, networking)
- Confidence: Confidence
- RoleModels: Role Models
- Initiative: Self-Initiative (i.e.: not waiting for an invitation)
- Balance: Work/Life/Family Balance Issues

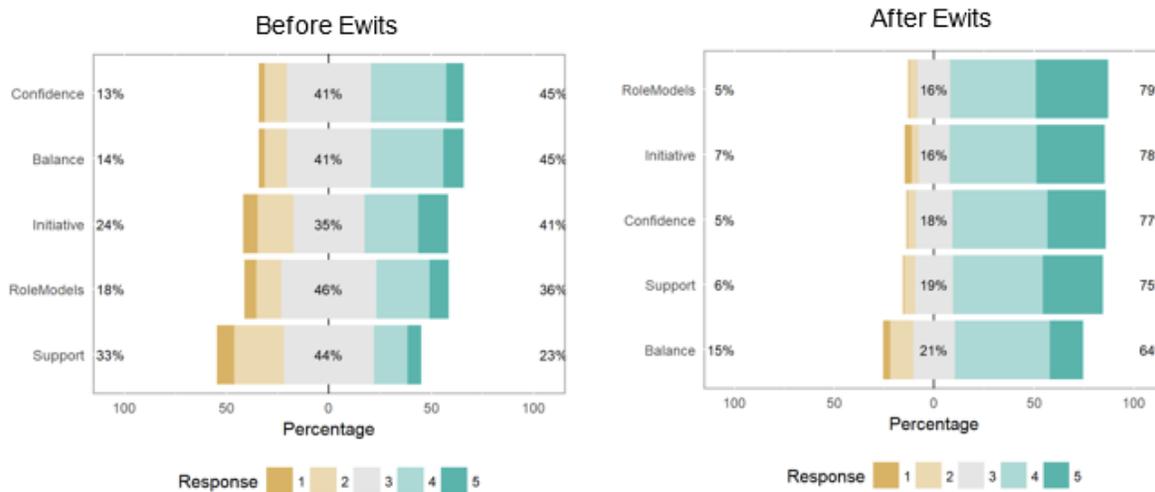


Figure 4-4. Self-Reported impact on perceived challenges before and after Ewits

Increased entrepreneurial intention

The 20 items from the Entrepreneurial Intention Questionnaire (EIQ) by Liñán, Urbano, and Guerrero, were added to the end-of-course survey in 2016. These questions were added to provide additional insight into the effectiveness of the program. The questionnaire uses a Likert scale with values of one to seven with one being low, seven being high four representing the mid-point. The questions are designed to evaluate entrepreneurial PA, PBC, SN and Intention. The questionnaire has been empirically validated for its effectiveness (SANTOS & LINAN).

In an attempt to understand the impact of Ewits on participants' entrepreneurial intentions the questions were included on the survey twice. In the first presentation,

participants were asked to evaluate the questions based on their perceptions after Ewits. On the second presentation, participants were asked to evaluate the questions based on their perceptions before Ewits. The results from those responses are included in Table 4-4 below.

The Ewits after participation scores were higher than all results from Santos et. al. with the exception of the Entrepreneurial intentions mean score for Bedfordshire men of 5.29 as compared to Ewits women mean score of 5.04. The before Ewits scores were lower than all of the results from Santos et. al. Seville women. Entrepreneurial SN was only evaluated once on the questionnaire and was grouped with the after questions.

Table 4-4. Mean responses on Entrepreneurial Intention Questionnaire (EIQ)

	Before Ewits	After Ewits	Difference	% Increase
Entrepreneurial Intention	4.110	5.040	0.930	23%
Entrepreneurial PA	4.718	5.748	1.030	22%
Entrepreneurial PBC	3.605	4.900	1.295	36%
Entrepreneurial SN		5.620		

Awareness of gender issues

The Ewits program addresses gender issues in two ways. First it is an all-female program in which the organizers, mentors and learners are all female. Second, the weekly information sessions include presentations and discussions designed to create awareness around both gender issues as well as barriers to entry that are more prominently experienced by women.

Increased awareness of gender bias in technology and entrepreneurship was reported on the open-ended questions in the End-of-Course survey and emerged in the interview data. One learner states, "It also helped me gain greater awareness of the

gender bias that I face and has spurred me to take a more active role in dealing with gender bias in the workplace” (end-of-course surveys). Another learner addressed the low participation of women in the field, and noted that participation in Ewits as an all-female program helped to build the confidence to break through barriers to entry. She wrote:

In my estimation, women themselves are hesitant about getting into this field. I think programs like Ewits are the answer. The program offers guidance and builds confidence in the abilities of the participants that can then be used to break the self-imposed barrier of entry.

Not all the participants were as adept at describing gender bias. Some of them talked about the opportunity to work with other women, which they had not experienced before in their programs or careers. Nadine said, “I was just wanting to see how well I worked with other women because I didn't really have that experience before.” Monique goes a bit farther and talks about the importance of building relationships with other professional women, learning to work both for and with other women. She describes a common gender bias about working for other women. She also expresses her wish that she could have had an opportunity to work for a woman and to have more female role models. She said:

I think it's really important for women to bond and to understand the importance of supporting one another and cheerleading each other. We all hear that thing about “I don't want to work for a woman,” and I think that's B.S. I think I would love to have worked for more women. I would love to have had role models that were women.

Shari talked about finding her own understanding in relationship to gender bias issues.

She said:

And I think sometimes the behaviors that I was attributing to gender issues were maybe relationship issues. And the relationship issues that I was attributing – you know, and vice versa. So, that was really interesting to see. There were enough women talking about their issues that it felt safe.

And famous women, on video, for example. And there were also local women who came in, you know, not super famous, but very successful at what they do. Each one would kind of talk about how they overcame a challenge and what it meant to them.

Shari's quote illustrates how the program encouraged reflection on gender issues in the work place. She evaluated her own understanding of gender issues as they related to relationship issues. She felt that having enough women talk about these issues created a safe space for exploration of her own understanding. Shari also made reference to the women who presented in class about gender challenges and how they overcame them.

Not everyone was comfortable with the emphasis on gender issues. Yet, they often acknowledged that they too had experienced some sort of gender bias or at least noticed the low participation of women in entrepreneurial spaces or in their own fields.

For example, one learner indicated:

Some women felt that the discussion around gender difference was slightly too much than what they realistically have experienced. However, reflecting on my attendance to the Celebration of Innovation event, I was really touched when I saw very few women there! I think the discussion of gender might be improved a little too, by adding more substantial materials such as scientific evidence and what gender researchers think about it.

The Celebration of Innovation event is an event that occurred at the Gainesville Hilton during the time of this cohort of Ewits. It is held in association with the UF Innovation Hub and the OTL, but was not part of the Ewits program. This learner would have attended because of a larger interest in technology entrepreneurship. As she described, she was surprised that with her new awareness of gender issues she was aware of how few women were participating. She also provided a critical recommendation to the program to include more scientific-based evidence on what research shows about gender bias. This feedback has been discussed with program organizers and they are

implementing plans to include more research-based information about gender bias in the upcoming 2017 session.

From the interview and learner responses on the End-of-Course survey, it is difficult to determine whether the awareness of gender issues by participants came from the nature of the all-female program or from the gender related discussions in the information sessions. There was however, evidence that these women were more aware of gender bias and were attempting to process and understand how that new awareness affects their confidence and perception of technology entrepreneurship.

A Unique Learning Environment

Study participants described three elements in the Ewits program that made it a unique and empowering experience for them. First, the participants were both challenged and empowered by the experiential learning project. Second, the all-female environment created a “safe space” for participants that allowed for risk-taking and a kind of comparison of one’s own experiences with other women who have had similar gender-related educational and career challenges. Furthermore, the program created a collaborative learning experience where participants learned from the mentoring, mentorship, and team relationship. In the data, it is often difficult to differentiate between responses to the pure rigor of the project, the experience of working with other women, and the collaborative learning experience of working with a mentor and a team. It is apparent that these experiences combined to create a shared identity related to their experience as Ewits participants and as technology entrepreneurs (see Entrepreneurial Identities above). The following sections will attempt to highlight each of these elements along with how they relate to their shared Ewits identity.

Challenging yet rewarding

Participants described the business plan and investor pitch creation process as extremely challenging, yet rewarding. The challenge pushed their limits while confirming new skills and competencies. The learner below discussed both the rigor and reward of the program, as well as the experience of working together with other women, and her resulting Ewits identity. From the 2015 End-of-Course survey she said:

Ewits was at once an experience so challenging I sought to embrace it fully and so challenging I wanted to shed it. I would not have wanted to face the challenges alone – therein, lies Ewits' strength: women from a variety of backgrounds and experiences joining together to learn, to share, to succeed, to get an experience, to empower – whether we're starting a business or changing the world. We are Ewits – hear us roar!

This learner described her experience as so challenging she wanted to embrace it fully and to shed it all at the same time. She referred to the strength that she experienced in this shared space with the support of other women, who she saw as contributing a variety of backgrounds and experiences to the success of the project. She experienced this as empowering. This quote was also interesting as it referred to a shared entrepreneurial identity including both the options of starting a business or changing the world (see Entrepreneurial Identities above). She also referred to herself in a collective with the other participants, “We are Ewits,” thus connecting her identity to the identity of Ewits.

In a similar manner, Harriet also described the experience:

I will tell you, it was an amazing program [REDACTED] and I think when you talk to the participants, for the most part, you're going to hear the same thing. Every group takes on a life of its own, every technology takes on a life of its own. But ultimately, it was an awesome experience. It's a little overwhelming to think about doing it again now, to be honest with you.

Here she again described the experience of the rigor of the program as being “a little overwhelming,” but within the context of it being an “amazing program” and “awesome experience.” She reflected not only on her own experience in this environment, but also on the experiences she observed among the other participants. Her language, and her enthusiasm illustrated a confidence, and an excitement, surrounding what the participants could accomplish in this environment of Ewits.

This was a reoccurring theme that participants described as a borderline overwhelming experience, that at the same time was an awesome experience they valued highly. This was an experience that pushed them to their limits, but allowed them to find their strengths, step up, and meet the challenge. Harriet showed that limit when she expressed that it would be overwhelming to think about doing it again. It seems that this combination of hard work, pushing them to new limits of their own understanding, combined with the elation of success after the investor pitch created a common shared experience which seemed to bond them together. Their participation in Ewits has become a part of their entrepreneurial identity.

Safe space

Ewits not only created a shared experience among participants, but it did so in a way that allowed women to experience it as “a safe space.” This created an environment where they learned how to work with other highly qualified, competent women. For some, this experience of being a gender majority, not a gender minority, was a unique experience. Several of the interviewees specifically referred to Ewits as a safe space. They talked about how they felt that they had the efficacy and ability to be successful prior to participation, but that Ewits helped them test their abilities in a safe

environment. As Natalie explained, “I feel maybe the confidence was already there. I didn't have a safe environment where I could just go and express those.”

Harriet also described the safe environment. She said:

I do think that it was – it made it a fun and interesting environment and – I can't think of the right words to put this in – maybe a safe environment. I don't think that people felt – if there was anything – I don't think people hesitated as much as they might have if men were in the room. I hate to say that, but I really think that's probably true.

Harriet alluded to the possibility of the safe environment being somehow linked to the nature of the all-female program. She felt this allowed the participants to reject hesitation “as much as they might have if men were in the room.”

The learners and interviewees also talked about the experience of working with other talented, highly qualified women. From the 2015 end-of-course survey:

It was wonderful to be part of a group of such smart and diverse women! Very empowering. [...] helped me view work life/salary issues from different perspectives [...] It helped show individual value each team member adds to a project. Also – how to communicate and come to conclusions and solutions together. With all women!

In this comment, the learner expresses (with a bit of surprise) both the empowerment of working with “smart and diverse women,” and she explained that it helped her to work on her own barriers to entry and to gain efficacy through networking, collaboration, and communication.

Some of the women described the opportunity to validate their technical skills, while developing an understanding of their strengths and additional learning challenges.

From the 2016 end-of-course survey:

Ewits was a great opportunity for me to validate that I have the necessary technical skills to take a patent and create a product. It also helped me to visualize my strengths and what things I need to work on in order start my own business. As an engineer, I suffered understanding financials and

marketing. However, after Ewits, I am not afraid of those areas, especially because I learned that it is OK to ask for help.

This learner talked about learning that it is “OK” to ask for help. This is an additional affirmation of the “safe space” theme, in that she found the space allowed her to be vulnerable enough to admit she did not know everything, and she could ask for help when needed.

Mentorship and collaboration

A core tenet of the Ewits program was the mentorship and team collaboration process. The Ewits Participant Workbook (Ewits, 2017a) described one of its learning objectives as an attempt to “Develop skills in working effectively in a team, creating a business plan, and delivering an investor pitch.” This mentorship and team collaboration not only provided space for team members to work together on developing their startup plan, but it also created space for them to have discussions related to the challenges and barriers to being women in a masculine-gendered field. Evidence of these conversations showed up in the open-ended questions and in the interviews. Evidence of the rigor of the program again showed up in the conversations about the mentor-team relationship.

The interview data provided further descriptions of mentor-team collaboration. The mentors described a process of watching their teams develop, learning how to work with each other, struggling through learning how to work out differences, and developing trust relationships along the way. They related the struggles in the teams to the struggles they had experienced in their own careers. They described Ewits as a very lifelike and authentic experience. For instance, Kim talked about how she navigated that relationship as a mentor, maintaining her distance, but providing guidance along the

way. She saw her role as helping the team to stay focused and on task as they worked together to accomplish their goals. She also discussed her own learning process as she learned to work with women who did things differently than she did.

She says:

The teamwork aspect of it was very intriguing, as it always is to watch how people interact with each other and with me. And you know, you almost always have dysfunctions on the team and experiencing not necessarily how I deal with it, because it's not always about me as a mentor, but you back away from it, and watch how these women deal with dysfunction because that's a part of the workplace. So, I learned a lot from slowing down enough to pay attention, because that was my job. To figure out how to help them win. And when I say win, I don't [sic] necessarily mean winning that prize at the end. It's asking, what is it that we're here to accomplish? And learning to work with women that are different than I am. Not necessarily in personality and character, but looking at how they solve problems.

Kim described the teamwork aspect as "intriguing." She explained how she as a mentor saw herself as part of this process, and how she learned along the way. She portrayed the team process as being authentic, requiring the women to "deal with dysfunction because that is part of the workplace" and learning how to solve problems with other women who may have a different approach.

Harriet found the mentoring process harder than expected. She talked about keeping her distance as a mentor, not stepping in to take over, but to provide guidance. She described the process of challenging her team to step up and make purposeful choices about how they wanted to see this challenge through. She said:

It's an amazing experience. It's like childbirth, literally. [...] It was harder than I expected it to be. I'll be honest with you. I did not expect it to be so hard. But I also was very disciplined with my role, and I maintained to them, "I can't do this for you. I am your mentor. I can help you, I can guide you, I can direct you, but I can't do this for you." That was hard not to do it.

Because rarely are you working by yourself. Some things, of course you are. But watching them, especially at the end when we didn't have what

we needed to be able to complete our investment pitch because one of the members – this always happens right? Somebody doesn't show up. Somebody doesn't get the information. And then to watch them, and how... what choice are you gonna make here as a team? Not me, but them. We fold. We can't get this done. Or we rally. And what is it gonna be? And what are you made of?

Again, we see the theme of challenging and rewarding as Harriet referenced the challenge of the process in her description. She talked about rallying at the end, stepping up, even in the face of adversity, to meet the challenge. Learning how to fill in the gaps, and how to make up for the team member who did not come through. Challenging her team about whether they would give up, or "rally." She placed the decision on them, and recognized that her role as mentor was to help them make decisions and then guide them through the process.

In both mentors' descriptions, managing the team work emerged as a challenge. This struggle also showed up in the learners' comments. They talked about the process of learning to work in a team, navigating the challenges and frustrations of team dynamics and figuring out how to get the job done. Rosa talked about the process of dealing with the internal frustrations and pulling together to complete the project.

I definitely learned a lot about all that it takes, and of just working together as a team, and how much that takes to put something together at a really quality level. And I think you can run into some challenges there. And on my team, we did have some internal frustrations by some of the team members and just trying to deal with that. It was a challenge, and that happens, though. [...] Towards the end, it was kind of, "Let's just get through and present." And maybe, I don't know, it's hard to figure out how to better manage that, so I think that was something just kind of learned.

Rosa described the flip side of Harriet's description, how she as a team member had to find her internal strength to step up to the challenge even when there were internal dynamics and frustrations among the team. She discussed the moment when they

decided to just push through and finish the project and the ultimate recognition of learning that maybe it was something she “just kind of learned.”

Deborah talked about finding her own confidence in a team full of leaders. She struggled with how to speak up when she did not think the right choice was being made. She felt like she should have spoken up sooner, instead of waiting. As she explained:

I like to take charge but I thought in this case I shouldn't do that because it was a whole table full of leaders. I admire every single person that I worked with. But on the other hand, there were a couple of us that were like, "Is this really the right choice?" And we really should have spoken up more and not worried about it so much. That's one thing I learned.

In her statement, her struggle to find her own confidence and her own voice was clear as she attempted to step up and express her opinion when she felt like the team was making choices she did not agree with.

Some of the teams experienced normal everyday outside influences that negatively affected the team, including sick family members, a team member dropping out because they got a new job, or team members who had outside demands which took up too much of their time. As this comment from the 2016 end-of-course survey explains:

Overall, I thought it was a great experience. It went a little too fast, but then again, we had problems slowing us down... sickness, family emergencies, one person dropped out. But the learning environment was great and building a business plan together was a very positive experience.

This learner expressed the frustration of normal team dynamics, and unexpected issues of family, illness, etc. Even with the frustrations, she felt that the learning environment was great and described an overall positive experience with the process. Overall, the mentor-team relationships seemed to have created an environment where both learners

and mentors were able to both test their efficacy in the competencies of entrepreneurship as well as their collaborative work skills.

After Ewits...

In both the end-of-course surveys and in the Interviews, participants expressed a desire for on-going support and networking after Ewits is over. Many of the teams have maintained ongoing relationships and have attempted to stay in contact with each other and with their mentors. One learner stated:

I learned so much from this program and from my team. I will miss attending Ewits, but I know I will remain close with my team. They were very special women, and it was such a remarkable experience in getting to know them.

Overall, most of the participants indicated a positive experience and a strong sense of bonding with those who shared the experience with them. There was a group of participants after cohort 2013 who attempted to establish an ongoing professional networking group for Ewits participants. However, due to the sometimes-transient nature of a University environment, many of those participants moved on to other locations and the group ultimately fizzled.

Several of the learners interviewed have either launched or are attempting to launch startups. They described a need for ongoing support with their new ventures.

From the 2016 end-of-course survey:

My recommendation is to start a transitioning program for those of us that have already identified a patent and are ready to start. A follow-up program will use our momentum to actually start our business.

They expressed a need for mentors, networks, funding, and access to resources. They wanted a place where they could ask questions and learn from others who had already experienced the struggles they are working through. One respondent stated:

I really think that we need to create a real network, where women can feel supported, receive the experienced advice at the right time and feel that we are not alone in this journey. Together we are stronger and can achieve more than every single one of us on their own.

Tasha indicated, "I wish I had gained more about how to get involved with university projects or into the hub, or getting things really rolling in Gainesville, and I don't think that happened." She expressed that she felt like after Ewits, she was on her own and there was not "a lot of perspective in terms of other resources in the community." Later in the interview she expressed:

I think if you'd have interviewed me right after I did the class, I would have thought, oh my God, this is the best thing since sliced bread. But then getting out there and actually trying to apply these things, there's so much more to know.

Monique also talked about a desire to maintain contact, and to continue the networking and mentoring relationships after the program was over. She said, "I think the only missing piece is that connecting, counseling, keeping in touch after the program is over and how you do that with people scattered all over the place?"

The organizers talked about wanting to create that next step. In fact, at the time of the writing of this report, they are preparing to open a Women's Collaboratory, which will be a space where women can continue both with their entrepreneurial education and a space where they can connect, continue to network, and have on-going access to mentors. Jane talks about the vision for the Collaboratory:

Ewits is an amazing program but the shortcoming is that after ten weeks - we empower them with the knowledge, the confidence, and we provide them the role models and the mentoring and the network, and then, it's gone. And when it's gone, is when they need it the most. Because now they've got the knowledge and the empowerment, and they need somebody to take them through that next level, right? Where they can take their idea, and their concept instead of the university technology and really move forward with it.

And that's the vision for the Collaboratory. And the reason we're calling it the Collaboratory is because we want it to be not just a UF and not just a HUB thing. I'm hoping Santa Fe will come and be a player in the Collaboratory, I'm hoping that work force – whoever has expertise in things that they can bring to bear on helping those women get from that point forward. Or just opening it up to other people, they don't necessarily have to have gone through the EWITS program to really continue to push the ball forward.

In her comments, Jane describes their next steps in establishing a Women's Collaboratory that will provide ongoing support to take them to the next level. The organizers recognize that Ewits is a short-term contribution to a larger long-term problem. If they are going to effect lasting change in the number of women participating in technology startups, they need to provide more resources, education, and networking to support them through the licensing, launching and capitalization processes.

Chapter Summary

Chapter 4 presented the research findings from this study. The findings include both quantitative and qualitative results from the curriculum and artifact review, analysis of learner applications, end-of-course surveys, and the fifteen semi-structured interviews. The research found that the learners described increased confidence in their entrepreneurial competencies, teamwork and collaborative skills, and their understanding of gender bias and barriers to entry for technology entrepreneurship. They also portrayed the experiential learning component as rigorous, challenging, and empowering. Many described the all-female environment as a safe space where they could ask questions and learn from other highly qualified women in the program. The mentor-team relationships contributed to the dynamic nature of the learning environment. The interviewees reported previous experience with either entrepreneurial

or strong female role models that inspired them. They described entrepreneurial identities as fluid, including innovation as well as entrepreneurship.

CHAPTER 5 DISCUSSION, LIMITATIONS, AND RECOMMENDATIONS

This chapter will discuss the research findings as they relate to the research questions and the theoretical frameworks of ambient belonging and gender bias. Limitation of the research will be presented. It will conclude with recommendations for future research and for developing and implementing educational programs like Ewits.

Discussion

This study aimed to understand whether educational interventions can help women succeed in technology entrepreneurship, a career field where women are underrepresented but where economic opportunity is high. Using a mixed method case study design, it examined the following three research questions: 1) How does Ewits strive to help women overcome barriers to entry into technology entrepreneurship? 2) What impact does Ewits have on participants' entrepreneurial attitudes and intentions? 3) How do participants describe their experience with entrepreneurship? The following sections synthesize the findings related to each question and considers these findings in the context of the research literature.

Research Question One

How does Ewits strive to help women overcome barriers to entry into technology entrepreneurship?

The barriers to entry into technology entrepreneurship that Ewits sought to address include work/life balance choices, self-confidence, lack of training, lack of a mentor network or role models and self-initiative (waiting to be asked) (Ewits, 2017a). Ewits aimed to help program participants overcome barriers to entry into entrepreneurship, first, by providing an experiential learning program designed to increase learner's knowledge of the core competencies needed to launch a technology

startup, and second, by creating a learning environment where the participants can explore their own understandings of gender bias and other barriers that impact their desire to enter entrepreneurship.

Experiential learning model

Piperopoulos and Dimov (2015) showed that individuals completing a theoretical only entrepreneurship education program often experience a decrease in entrepreneurial self-efficacy and resulting entrepreneurial intentions as compared to those who completed a practically-based entrepreneurial education program. Those in the practically oriented programs saw their self-efficacy and resulting entrepreneurial intentions increase. Ewits provided professional development to participants through an experiential learning project focused on increasing the entrepreneurial competencies and skills needed to successfully launch a technology venture.

Shane and Venkataraman (2000) similarly contend that entrepreneurship education should include the process of discovery, evaluation, and exploitation of opportunities, including the individuals who discover, evaluate, and exploit these possibilities. Ewits was successful in providing most if not all of these elements through an experiential learning simulation where participants worked together to select a technology from the Office of Technology Licensing (discover), research the opportunities for marketing this technology (evaluate), and prepare to launch a technology startup (exploit). The simulation provided a realistic understanding of the challenges, dedication and effort that are required to gain success in a technology startup. Participants met with licensing officers, worked with entrepreneurial mentors and other team members just as if they were planning to launch a real technology startup. During the research and discovery process, and the investor pitch, learners

received feedback and evaluation from experienced entrepreneurial mentors, angel investors and venture capitalists, and from each other. This feedback and evaluation served as further validation of achieved competencies. During the investor pitch competition, the participants observed the investor pitches from the other teams and heard the feedback provided to all the teams. This allowed them to learn more about how a real investor pitch would be evaluated for potential funding as well as compare their own competencies and understandings with other team members and experienced entrepreneurs.

Learning environment

Ewits created a learning environment where the participants are able to explore their own understandings of gender bias and other barriers that impact their desire to enter entrepreneurship. Santos et. al (2016) recommend implementing educational interventions that focus on the cultural environment in the field of entrepreneurship and that include successful female role models and guest speakers that do not reflect the norms of a masculine-dominated field. Ewits attempted to do this first, by creating an authentic entrepreneurial environment where participants experienced entrepreneurship, second, by providing experienced entrepreneurial female role models as mentors, presenters, and judges, and third, by creating space where participants were able to freely discuss, as well as examine their own experiences and understandings of gender bias.

The program was hosted at the University of Florida's Innovation Hub. This situated the learning environment within the context of entrepreneurship, both in the authentic nature of the simulation, as well as with the people who do entrepreneurship and in a place where entrepreneurship is conducted. The organizers and facilitators

either worked in or were highly familiar with the role of the Innovation Hub in both licensing and housing startup ventures. As participants walked through the building, they could see pictures, awards and other evidence of startup companies and their successes.

Ewits provided participants with opportunities to engage with female role models through the experiential technology transfer project where learners and mentors closely collaborated and also through guest speakers and the investor pitch judges. Organizers specifically attempted to recruit successful entrepreneurial mentors, presenters and judges who could serve as role models throughout the program. The mentor-team structure of the program, allowed participants to engage with many highly educated female leaders in science, technology, and entrepreneurship.

The Ewits program attempted to address issues of gender bias through guest speakers who talked about their experiences as female technology and entrepreneurial leaders including the biases they had experienced in their careers. The weekly presentations served as a catalyst to engage the learners in discussions about how women experience gender bias and stereotype threat as leaders in technology and entrepreneurship careers. These discussions occurred during the weekly informational sessions often carrying over into the weekly group work sessions.

Research Question Two

What impact does Ewits have on participants' entrepreneurial attitudes and intentions?

Entrepreneurial intentions (EI) are the result of an individual's Perceived Behavior Control (PBC), or feasibility of entrepreneurship, and a person's Personal Attitude (PA), or desirability of entrepreneurship (Shapero and Sokol, 1982, Ajzen,

1991). Ajzen includes the influence of the sociocultural context, or Subjective Norm (SN) as a variable which reflects the value culture (CV) places on entrepreneurship. Ewits had a positive impact on participants entrepreneurial attitudes and intentions. Through the experiential learning model, they were successful in helping learners develop an increased understanding of and confidence in their abilities to be successful at entrepreneurship (PBC & PA). Through the learning environment they were able to help learners shift their perception of the gendered sociocultural norms (SN) of entrepreneurship.

Confidence in entrepreneurial abilities

Ewits had a positive impact on learner's perception of entrepreneurial competencies (PBC) and on their personal attitudes (PA). Learners report they feel more confident about their entrepreneurial abilities as a result of their participation in Ewits. End-of-course surveys show that learners reported gains in both the mastery of entrepreneurial competencies and their understanding of barriers to entrepreneurship. Ewits was also successful in increasing learner's personal perception of their entrepreneurial abilities as measured by the increase in entrepreneurial PBC and PA on the 2016 end-of-course surveys. In the responses to the open-ended qualitative questions and interview learners noted increased confidence in learning new skills and experiencing validation of the skills they already had prior to the program.

Both the learners and mentors describe the rigor and frustrations of the challenge of the experiential learning exercise as well as the resulting confidence that was gained when they succeeded in accomplishing the task. The amount of knowledge and learning required was at first overwhelming, but as they applied that knowledge and worked out what it takes to accomplish the task, they saw their efficacy and confidence increase.

This feedback loop allowed for confirmation and development of self-confidence in their entrepreneurial abilities. Because they had the opportunity to then test their knowledge and abilities in a realistic simulation, with feedback from experienced entrepreneurs, they were able then build confidence in their new knowledge.

Combating gendered sociocultural norms

Santos et al. (2016) found that when the cultural value (CV) of entrepreneurship increased, men's PA would increase, however, the increase in CV had no impact on women's PA. They argue that females do not see an increase in PA because they do not see entrepreneurship as a career option for them, and thus the value society places on entrepreneurship does not affect them in the same way as it does males. This difference in perception of cultural value could be a result of gendered social norms (SN) which do not value women's contribution as highly as men's in the masculine gendered environment of entrepreneurship. The premise that women do not see entrepreneurship as a career option, aligns with the theory of ambient belonging. If women do not see themselves as fitting in technology entrepreneurship, then they will not perceive increased SN, and will continue to have low PA, or desirability for technology entrepreneurship.

What makes Ewits unique is the learning environment which placed a strong cultural value not just on entrepreneurship, but specifically on women's participation in entrepreneurship. Thus, they increased the CV and subjective norm (SN) of entrepreneurship in a way that the female participants felt their contribution was valued. Ewits created this environment by (1) recruiting highly educated women, from science, technology, and engineering fields, for the all-female educational program, (2) including experienced female entrepreneurial role models as team mentors, presenters, and

judges, and (3) creating space to talk about gender bias. In those efforts, they were successful in creating an environment where the participants felt they belonged. The lack of masculine gendered norms may have also created an environment where individuals did not feel the pressures of stereotype threat and where they were free to act according to their own identities (Steele, 2011). Zanna and Pack (1975) showed that individuals in a single-gendered group are less likely to act according to stereotypical social roles. They draw a connection between being in the presence of the other gender as invoking behaviors that confirm to societal gender roles. In a single gendered space, individuals must take on all roles, even those that might normally be reserved for individuals of a different gender. This gives individuals an opportunity to try on and gain efficacy in non-traditional roles.

Research Question Three

How do participants describe their experience with entrepreneurship?

Yardav and Unni (2016) suggest that women perceive entrepreneurship within the context of their social networks including family, society and personal relationships. This is different from the traditional view of entrepreneurship as creating economic value and puts more focus on the experience of doing entrepreneurship and the value it brings to their lives and their families. The participants in this study describe their experience with entrepreneurship in terms of experiences with role models, opportunities for innovation, or a desire to create something new.

All the interviewees could identify at least one entrepreneurial or strong female role model that inspired them and influenced their career choices including their own entrepreneurial identity. They talked about how these role models exhibited lifestyle choices and benefits they wanted to have in their lives. Even when they struggled to

succeed financially, the participants could see how the experience was rewarding and provided many advantages in building networks, or providing quality of life benefits.

The participants see themselves as entrepreneurs, as innovators, and as supporters of entrepreneurship. They talk about their own entrepreneurial identity as being intertwined with an innovator identity. Some describe efforts to launch new startups after their Ewits participation, others describe an interest in participating in a startup if the conditions are conducive to their needs. Even the women who do not expect that they will launch their own startup venture, see themselves as innovators and as leaders that contribute to the development of innovative ideas and technologies within their current careers.

When the participants talk about their own entrepreneurial ideas they often focus on the intrinsic benefits of entrepreneurship. They focus more on the process of doing entrepreneurship rather than on the economic or financial benefits of entrepreneurship. They talk about having an idea they want to see happen or a problem they want to solve. They also talk about the barriers to success, the lack of capital, lack of networks and support structures. These experiences are consistent with those that were identified in literature (Fink and Haisley, 2015, Calas et al., 2009)

Envisioning Entry in Technology Entrepreneurship

Scholars have argued that PBC (entrepreneurial ability) and PA (entrepreneurial interest) are both necessary conditions for entrepreneurial intention (EI) and that intention is a precursor for behavior and actual participation in the field. Using feminist theory, the framework proposed two additional components to this model. First, it included stereotype threat and gender bias as potential filters or barriers that might prevent women from turning feasibility and desirability into intention and actual

engagement in the field. Second, it reframed the notion of entrepreneurial interest as embedded in a broader sociocultural context of ambient belonging. Whereas stereotype threat might affect women’s sense of competency and ability, a lack of ambient belonging prevents women from choosing a career in this field. Figure 5.1 presents a simplified version of this original model.

The findings of this study suggest that this model can and needs to be further refined to account for decreased PA even in the presence of increased cultural value of entrepreneurship.

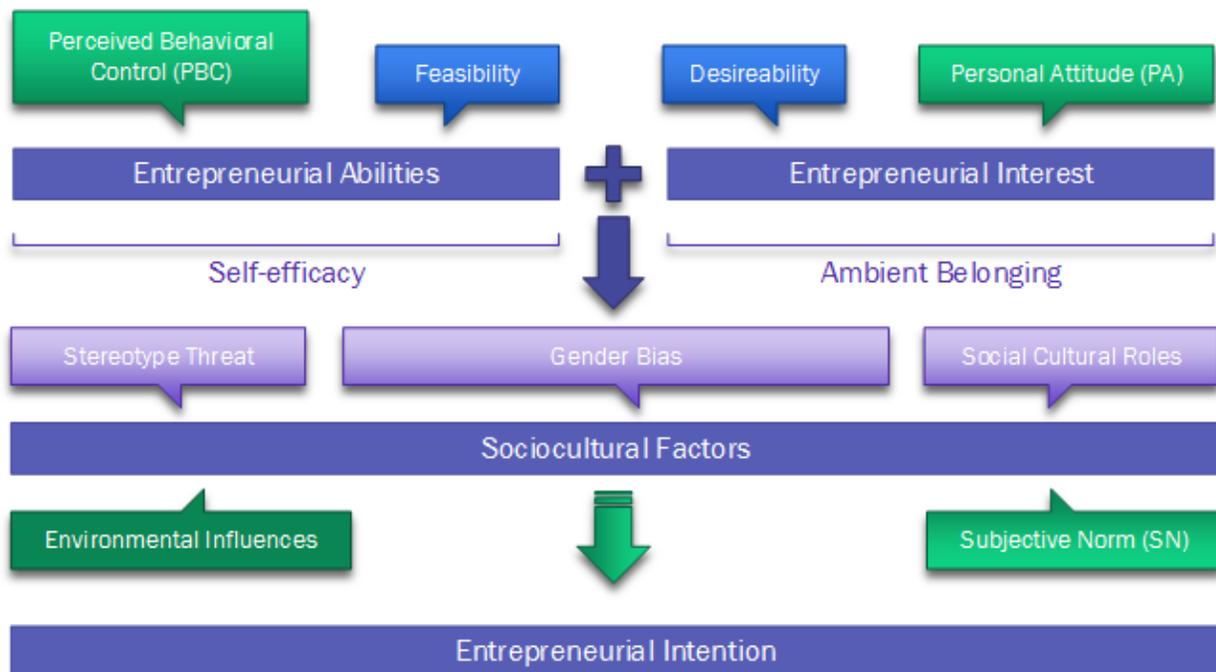


Figure 5-1: A model for understanding the impact of gender bias and ambient belonging on entrepreneurial intentions.

Limitations

While this research focused primarily on personal attitude and ambient belonging, we must not lose sight of the overall societal responsibility to end gender bias in a gendered field. It is not the minority participants burden to shift societal norms,

but the burden of those who have the privilege of naturally representing the majority norms, that need to reflect on their own personal biases and begin to change the way we evaluate those who operate in a manner that is different from the gendered norm of society.

The researcher was integrally involved with the Ewits program throughout the course of the study, including participation as a mentor in the 2014 cohort and as a mentor's mentor in the 2016 cohort. While every effort was made to ensure an unbiased representation of the data that was gathered from the program, there is a limitation in that the researcher might be more likely to portray a more positive representation of the program and miss negative representations.

There are limitations with the generalizability of the learner population. This is a highly educated, mostly affluent, group of women who self-selected into the program. These participants have resources and a certain amount of privilege which will help them succeed in spaces where others with less privilege may struggle. The results from this study will need to be compared with other learner groups who may not have the same level of privilege to support their self-efficacy and subjective norms. At this time, there are additional concurrent studies being conducted with StartUp Quest, a mixed-gendered implementation of the same experiential learning model. The Startup Quest studies can provide a comparison to Ewits results which will help to better understand the long-term effectiveness of the educational model and the generalizability of the research results.

Another limitation is the nature of the data collection. Phase One of the study relied on applications and surveys that were collected prior to the research period.

While the survey results give us insight into the perception of the women completing the program, they do not validate their competencies. In addition, there was missing data from 2012, and some anomalies in the data set which made it difficult to fully interpret the responses. It would be useful in future iterations of the program if the questions on the End-of-course surveys could be vetted and validated to ensure they will produce the results that are intended. The organizers indicated that all of the learners were required to turn in their End-of-course surveys prior to entering the investment pitch competition. However, the number of surveys provided in the data set was lower than the number of program completers. This could be due to an imprecise method of ensuring survey collection, or could represent a potential missing set of data. Due to the number of survey's available $n=151$ (completers $n=170$) it does not appear that the missing surveys would adversely affect the results of this study.

As a mixed-methods study, some of the data for this research is gathered from participant's personal perceptions and anecdotal evidence. While the researcher reviewed the transcripts and coding reports several times, there are undoubtedly other themes that could emerge from a different reading of the data. Further study of the existing data may be needed to better understand the themes that emerged and to consider other perspectives in the analysis.

One limitation with the data collected in the End-of-course survey is that it only reflects the learners' perceptions of their skill levels before and after attending Ewits. It does not reflect an external evaluation of their competencies. Learners are provided with feedback on their demonstrated competencies during the investor pitch competition on both their business plan and their presentation. Experienced venture capital and

angel investors provide this feedback. While this data was collected during this research, it was not analyzed. It will be included in the recommendations for future research.

There is little data available to answer the question of whether this educational program has an impact on participant's entrepreneurial behavior. While some of the participants do describe efforts to launch new startups after their Ewits participation, there will need to be further study to understand the long-term effects of Ewits on entrepreneurial behavior.

This study focused primarily on participant perceptions as such there is not independent review of those perceptions, nor is there an effective measure of external influences. Some of the limitations of this approach include: (a) there is no measure of actual gender bias, (b) there is no measure of actual stereotype threat, and (c) there is no measure of actual competency proficiency.

Recommendations

As a result of this study there are both recommendations for future study, and recommendations for the educational model.

Recommendations for the Educational Model

The following recommendations are based on feedback on the end-of-course surveys and interviews. They are not part of the findings, but are included here to give feedback on the overall effectiveness of the program.

- Consider implementing a flipped classroom model where participants watch videos before coming to the weekly information sessions. This will allow more time in class for guest speakers, discussion, and team work.
- Improve the educational component addressing stereotype threat and gender bias ensuring that it is based on research and effective intervention methods.

- Continue with plans to develop a follow-up program with the Women's Collaboratory as well as other resources to assist early stage entrepreneurs in achieving their startup goals.

Recommendations for Future Study

During this study, a wide variety of data was collected, and not all of it was analyzed for this study. This includes follow-up surveys, business plans and investor pitches, including judges scoring sheet and recommendations. The follow-up surveys have been administered annually since 2014 and captures data from learners over a period of time. Analysis of this data could provide insights into the long-rang impacts of the program.

Additional research needs to do a deeper dive into the effects of gendered norms in a gendered field and shifting individual perceptions of these fields. While Ewits was successful in shifting participants perception of the culture of entrepreneurship during course the program, an understanding of the long-term effects of this program on program participants could reveal insights into whether or not this experience was effective in shifting individual's entrepreneurial attitudes, intentions, and behaviors.

Future research should include research into effective engagement practices in educational settings that not only impact gender bias, but help other underrepresented students engage in a way that they develop efficacy and a sense of belonging that will allow them to succeed.

APPENDIX B END-OF-COURSE SURVEY

Thank you for participating in the Spring 2015 ewits® Program!						
Please help us continue to improve this experience for future participants by completing this survey.						
	Please rate from 1-5 for each category (scale 1=poor, 3=average, 5=excellent)					N/A (did not attend)
How helpful was the Informational Session in providing an overview of what the program would encompass? Please include feedback about the Informational Session:	1	2	3	4	5	N/A
How would you rate your opportunity to review the technologies during the Technology Matching Session 1? Please include feedback about the Technology Matching Session 1:	1	2	3	4	5	N/A
Who was your mentor? (Circle one) Tavara Andrews - #13906, Catalysts for cost-effective production of Hydrogen as an alternative fuel Susan Baumgartner - #12655, More effective nerve repair without sutures Maggie Insogna - #14171, Social network for college students that protects users' reputations Penelope Jones - #14227, Chemical reactions for producing polyesters and polyamides from recycled materials Kelly Markey - #12561, Portable chemical sensor that detects breast cancer in exhaled breath Nola Miyasaki - #12838, Nanorod design for preventing cell adhesion to implanted devices Terry Van Nortwick - #12402, Light extraction mechanism for Organic Light-Emitting Devices (OLEDs)						
How would you rate your mentor's knowledge regarding entrepreneurship?	1	2	3	4	5	
How would you rate your mentor's accessibility outside of the scheduled program meeting hours?	1	2	3	4	5	
How would you rate your mentor overall?	1	2	3	4	5	
Please provide any additional feedback regarding the mentorship experience:						
How would you rate the ewits® website in terms of providing information about the program?	1	2	3	4	5	N/A (didn't access)
How helpful was the UF library resources page?	1	2	3	4	5	N/A (didn't access)
How would you rate access to the program materials on e-Learning in terms of ease of use? (Participant Workbook, Resources, Program Announcements)	1	2	3	4	5	N/A (didn't access)
How would you rate accessing the Videos on e-Learning in terms of ease of use?	1	2	3	4	5	N/A (didn't access)
How would you rate the Discussion Forums on e-Learning in terms of communicating with your team?	1	2	3	4	5	N/A (didn't access)
Please include feedback about e-Learning:						
Videos: For each session, please provide ratings for the videos and include any additional feedback you may have.						
Please rate the Videos from 1-5 for each category (scale 1=poor, 3=average, 5=excellent)	Information Provided (1-5)	Relevance to Project (1-5)	Speaker Presentation Skills (1-5)			
Session 2: Understanding the Value Proposition (Randy Scott)						
Session 2: Forming the Management Team (John Spence)						
Session 3: Market Analysis and Strategy (Karen Zaderej)						
Session 4: Commercialization Strategy (John Engels) and Intellectual Property-IP (John Byatt)						
Session 5: Financials (Angela Pate)						
Session 5: Financials Spreadsheet Video (Rebecca Prince)						
Session 6: Company Presentations (Sue Washer)						
Session 7: Corporate Structures (John Spence)						
Session 8: Sources of Funding (Weaver Gaines)						
Page 1 of 2						
Please provide any additional feedback regarding the session videos:						
The time allotted each week for speakers was (circle one): Too Short About Right Too Long						
The time allotted each week for teamwork was (circle one): Too Short About Right Too Long						

Please provide any additional feedback about the sessions overall:

Please rate the following benefits/skills/knowledge levels in terms of how much you feel your participation in the ewits® program has impacted your personal understanding for each area. (Circle one for each category. Scale 1=poor, 3=average, 5=excellent)

	Before ewits®					After ewits®				
The technology commercialization process	1	2	3	4	5	1	2	3	4	5
How to conduct market research	1	2	3	4	5	1	2	3	4	5
How to write a business plan	1	2	3	4	5	1	2	3	4	5
How to develop an investor presentation	1	2	3	4	5	1	2	3	4	5
Funding sources for startup businesses	1	2	3	4	5	1	2	3	4	5

Research identifies various barriers to entry for women in assuming leadership positions in technology startups. Please rate the following in terms of how much you feel your participation in the ewits® program has impacted your personal perceived challenge(s). (Circle one for each category. Scale 1=poor, 3=average, 5=excellent)

	Before ewits®					After ewits®				
Support Systems (mentoring, networking)	1	2	3	4	5	1	2	3	4	5
Confidence	1	2	3	4	5	1	2	3	4	5
Role Models	1	2	3	4	5	1	2	3	4	5
Self-Initiative (ie: not waiting for an invitation)	1	2	3	4	5	1	2	3	4	5
Work/Life/Family Balance Issues	1	2	3	4	5	1	2	3	4	5

What more could the ewits® team do to positively affect perceptions around these barriers to entry?

General Questions: Please rate from 1-5 for each category (scale 1=poor, 3=average, 5=excellent)

How clear were the instructions and assignments?	1	2	3	4	5
How helpful was the ewits® Participant Workbook?	1	2	3	4	5
How helpful was the program Leadership Team?	1	2	3	4	5
How would you rate the quality of the training program overall?	1	2	3	4	5

How many hours a week on average did your team meet outside of the program? (Circle one) 1-2 hrs; 2-3 hrs; 3-4 hrs; 4-5 hrs; More than 5 hours

The programs' duration was (circle one): Too Short About Right Too Long

How many hours a week on average did you spend on research, reading and business plan development? (Write # of hours):

Would you recommend this program to other women? Yes No Unsure

Please share any additional information regarding the ewits® program and your experience:

What is your area of expertise? (Circle one)

Finance Business Science Engineering Computer/IT Marketing/Communications/Design Other (please specify): _____

What is your highest level of education completed? (Circle one)

High School Diploma Associate's Degree Bachelor's Degree Master's Degree Ph.D. Other (please specify): _____

What is your age? (Circle one)

18-24 25-34 35-44 45-54 55-64 65-74 75 or older

Circle the answer that best describes your current situation:

married or in a committed relationship with no children
 married or in a committed relationship with grown children (18+)
 married or in a committed relationship with school aged children (5-18)
 married or in a committed relationship with younger child/children (under 5)
 single with no children
 single parent with grown children (18+)
 single parent with school aged children (5-18)
 single parent with younger child/children (under 5)

Thank you for your valuable input enabling us to continue to improve the ewits® program for future participants.

APPENDIX C
INTERVIEW PROTOCOL DOCUMENTS

Interview Protocol

Prior to the Interview

- Review and complete Informed Consent if not already complete.
- Begin recording.

The Interview:

- Thank participants for agreeing to participate in this research project.
- Confirm with interviewee that the consent to the interview and the recording.

Note: Some questions are only applicable to a particular stakeholder group. They are indicated as follows: T: Team member, M: Mentor, O: Organizers & Facilitators.

Research Question	Interview Question
Background, demographics & warm-up	1. For our first question, can you tell me a bit about yourself and your background? (Education (level of degree & discipline area), job experience, family/friends, age, interests).
2a, 3b	2. Tell me about your background with entrepreneurship and how you came to be interested in learning more about entrepreneurship?
2a, 3b	3. Have you ever worked for or started an entrepreneurial venture / startup company?
2a, 3b	4. Has anyone in your family or close network of friends worked for or started an entrepreneurial venture / startup company?
2a, 3b	5. Did you have any previous entrepreneurial education prior to participating in Ewits?
Background	6. T&M: How did you learn about Ewits?
2a	7. T&M: What did you hope to learn from your participation in Ewits?
2a	8. T&M: What do you feel you gained from your participation in Ewits?
2a, 2c	9. T: Do you feel confident that you have the knowledge, skills and or inclination to launch or work for a startup venture?
2a, 2c	10. T: How did participation in Ewits affect your confidence the you could be a successful entrepreneur or employee of a startup?
2a, 2c	11. T: How did participation in Ewits contribute to your personal desire to become an entrepreneur or work for a startup?
2a, 3c	12. M: How well do you believe the Ewits program prepared your team to understand the skills and challenges of becoming an entrepreneur?
1	13. O: Tell me about how you first got involved with Ewits?
3a	14. Do you feel like gender will impact your ability to be successful in entrepreneurship or a science/technology focused career?

- | | |
|--------|--|
| 1, 3a | 15. M&O: How do you envision Ewits will help participants to address the gender issues in technology and entrepreneurship? |
| 3a | 16. T: Do you feel like participating in an all-female entrepreneurship education program had any impact on your perception of your ability to succeed in entrepreneurship or technology careers? |
| 2a, 2b | 17. T: Do you have any future entrepreneurial interests or plans? |
| 3b | 18. T: Are there any other factors or considerations that impact your entrepreneurial interests or plans? |
| 1,2,3 | 19. Is there anything else you would like to share with us about your participation in Ewits that you think would benefit our research? |

Information after the interview:

Thank participants for their participation and remind them that I will follow up with a transcript for their review and further input.

Interview protocol page 1

Informed Consent

Working Title

Empowering Women in Technology Startups: The Impact of Women's Entrepreneurial Education

Please read this consent document carefully before you decide to participate in this study.

Purpose of the research study

The overarching goal of this research is to develop an understanding of whether participation in Empowering Women in Technology Startups (Ewits®) entrepreneurial education program has a positive impact on women's entrepreneurial personal attitudes (desirability of entrepreneurship) and intentions (feasibility of entrepreneurship).

What you will be asked to do in the study

During this study we will interview program organizers, mentors and team members who participated in one of the five offerings of Ewits® held between 2012 and 2016. Interviews will be conducted in person or via video conferencing at a mutually agreed upon time, date and place scheduled between the interviewee and interviewer. Interviews are expected to last approximately 45 minutes to one hour. All interviews will be recorded using an audio recording device and transcribed for analysis. The written transcriptions will be shared with you to give you an opportunity to review your responses to ensure we fully understood your perspectives.

Time required

1 hour

Risks and Benefits

There are no known risks to participants. There are no expected benefits for individual participants. Although the results from this study may help Ewits assess and improve the program, neither the principal researcher or faculty advisor have any direct involvement in the establishment or oversight of Ewits. The principal researcher has participated in the Ewits program as a team mentor.

Confidentiality

Your identity will be kept confidential to the extent provided by law. Your information will be assigned a code number. The list connecting your name to this number will be kept in a secure file, in a secure server. When the study is completed and the data have been analyzed, the list will be destroyed. Your

name will not be used in any report. All recordings and transcripts will be stored in a secure server and will not be connected to your name or any personally identifying information. At the end of this study, all audio recordings will be destroyed.

Voluntary participation

Your participation in this study is completely voluntary. There is no penalty for not participating. In addition, during the interview, you will have the right to waive any question you do not wish to answer.

Right to withdraw from the study

You have the right to withdraw from the study at any time without consequence.

Who to contact if you have questions about the study

Principal Researcher: Cheryl Calhoun, PhD Candidate, School of Teaching & Learning, College of Education, University of Florida, cdcalhoun19@ufl.edu, 352.575.0261

Faculty Advisor: Dr. Carole Beal, Professor, College of Education, University of Florida, crbeal@coe.ufl.edu, 352.273.4178

Who to contact about your rights as a research participant in the study

IRB02 Office
Box 112250
University of Florida
Gainesville, FL 32611-2250
phone 392-0433.

Agreement

I have read the procedure described above. I voluntarily agree to participate in the procedure and I have received a copy of this description.

Participant: _____ Date: _____

Principal Investigator: _____ Date: _____

Interview Questions

Note: Some questions are only applicable to a particular stakeholder group. They are indicated as follows: **T**: Team member, **M**: Mentor, **O**: Organizers & Facilitators.

1. For our first question, can you tell me a bit about yourself and your background? (Education (level of degree & discipline area), job experience, family/friends, age, interests).
2. Tell me about your background with entrepreneurship and how you came to be interested in learning more about entrepreneurship?
3. Have you ever worked for or started an entrepreneurial venture / startup company?
4. Has anyone in your family or close network of friends worked for or started an entrepreneurial venture / startup company?
5. Did you have any previous entrepreneurial education prior to participating in Ewits?
6. **T&M**: How did you learn about Ewits?
7. **T&M**: What did you hope to learn from your participation in Ewits?
8. **T&M**: What do you feel you gained from your participation in Ewits?
9. **T**: Do you feel confident that you have the knowledge, skills and or inclination to launch or work for a startup venture?
10. **T**: How did participation in Ewits affect your confidence the you could be a successful entrepreneur or employee of a startup?
11. **T**: How did participation in Ewits contribute to your personal desire to become an entrepreneur or work for a startup?
12. **M**: How well do you believe the Ewits program prepared your team to understand the skills and challenges of becoming an entrepreneur?
13. **O**: Tell me about how you first got involved with Ewits?
14. Do you feel like gender will impact your ability to be successful in entrepreneurship or a science/technology focused career?
15. **M&O**: How do you envision Ewits will help participants to address the gender issues in technology and entrepreneurship?
16. **T**: Do you feel like participating in an all-female entrepreneurship education program had any impact on your perception of your ability to succeed in entrepreneurship or technology careers?
17. **T**: Do you have any future entrepreneurial interests or plans?
18. **T**: Are there any other factors or considerations that impact your entrepreneurial interests or plans?
19. Is there anything else you would like to share with us about your participation in Ewits that you think would benefit our research?

Note: This letter will be sent via e-mail to all potential interviewee candidates from my official UF e-mail at cdcalhoun19@ufl.edu

Dear *Potential Interviewee Name*:

I am an PhD Candidate at the University of Florida. As part of my dissertation research I am conducting interviews with individuals who have previously participated in Empowering Women in Technology Startups (Ewits®) entrepreneurial education program as either a program organizer, a mentor, or a team member. The purpose of these interviews is to develop an understanding of whether participation in Ewits® has an impact on women's entrepreneurial personal attitudes and intentions. I am asking you to participate in this interview because you have been identified as a past participant in the Ewits® program.

Your interview will be conducted in person or via video conferencing at a time, date and place mutually agreed upon. Interviews will last approximately 45 minutes to one hour. With your permission I will record the interview using an audio recording device. The audio recording will be used to create a transcript of the interview which you will have an opportunity to review and provide additional input to ensure I fully understand your perspectives. For your review, I've attached a schedule of questions to this e-mail. I've also attached a copy of the Informed Consent agreement which will need to be signed and returned to me prior to conducting an interview. Feel free to sign and scan a copy to return via e-mail, or if we are conducting an in person interview, we can sign the agreement prior to beginning our interview.

If you have any questions about this research protocol, please contact me at cdcalhoun19@ufl.edu or 352.575.0261 or my faculty supervisor, Dr. Carole Beal, at 352.273.4178. Questions or concerns about your rights as a research participant rights may be directed to the IRB02 office, University of Florida, Box 112250, Gainesville, FL 32611; (352) 392-0433.

Thank you in advance for considering participation in this research project. I look forward to speaking with you and learning more about your experiences with the Ewits® program.

Cheryl Calhoun

Attachments:

Informed Consent
Interview Questions

APPENDIX D TIDYING THE DATA

Cheryl Calhoun

26 March, 2017

Available Artifacts

The following is a list of artifacts currently available from five annual offerings of the program. The artifacts from the first cohort (2012) are incomplete. There is some summary data available that can help in developing an understanding of the 2012 cohort. The 2012 summary data will be incorporated into the narrative where appropriate. The artifacts from the most current cohort (2016) are still being assembled.

Data Available by Cohort as of July 24, 2016

Cohort	2012	2013	2014	2015	2016
Mentor Bios	NO	YES	YES	YES	NO
Speaker Bios	NO	YES	YES	YES	NO
Judges Bios	NO	YES	NO	YES	NO
Mentor Meeting Agendas	NO	YES	NO	NO	NO
Session Agendas	NO	YES	YES	YES	NO
Technology Descriptions	NO	YES	YES	YES	NO
Applications	NO	YES	YES	YES	YES
Application Results	YES	YES	YES	YES	YES
Attendance Results	YES	YES	YES	YES	YES
Resumes	NO	YES	YES	YES	YES
Business Plans	YES	YES	YES	YES	YES
Team Assignments	YES	YES	YES	YES	YES
Business Plan Scoring Sheets	NO	YES	YES	YES	NO
Investor Presentations	YES	YES	YES	YES	YES
Investor Plan Scoring Sheets	NO	YES	YES	YES	NO
Participant Surveys	Partial	YES	YES	YES	YES

Application Data

The applications were collected using an online application. The composition of the application evolved over time and questions were added or updated before each new cohort. This required a bit of data collection and data wrangling to get the data into a form for analysis.

Application Data Code Book

Applications Table

Field	Data Type	Description
Identifier	character	Unique identifier concatenated from (Cohort + P + Entry ID)
TeamID ¹	character	Program Team Assignment concatenated from (Cohort + T + Team ID)
Path ¹	character	Path to case node in Envivo.
Cohort ¹	character	Year of cohort (YYYY).
Accepted ¹	logical	Was participant accepted to program?
Decision ¹	logical	Did participant attend program?
Finished ¹	logical	Did participant finish program?
Entry.Id	character	Unique identifier assigned by application system.
Team ¹²	character	Program Team Assignment. Assigned each team an ID (A:H).
First ²	character	First Name
Middle ²	character	Middle Name
Last ²	character	Last Name
Phone ²	character	Participant's Phone Number
Phone2 ²	character	Participant's Alternate Phone Number
Email ²	character	Participant's Email Address
Email2 ²	character	Participant's Alternate Email Address
Address1	character	First line of address. (2014+)
Address1	character	Second line of address. (2014+)
city	character	Name of City (2014+)
State	character	Two digit State code (2014+)
Zip	character	Mailing address zip code (2014+)
Country	character	Mailing address country (2014+)
Degree	factor	Participants Highest Degree Earned (PhD, Master, Bachelor, Associate, HS)
Experience	character	A description of the field of work/educational experience.
Q4	factor	How did you hear about the program? (Check All That Apply)
Q4a		Checked: Program website
Q4b		Checked: Past participant
Q4c		Checked: Facebook/Twitter/LinkedIn
Q4d		Checked: Email

Q4e		Checked: OTL newsletter
Q4f		Checked: Newspaper article
Q4g		Checked: Word of mouth
Q4h		Checked: Other
Q4Other	character	Fill in the blank for Other. (2014+)
Q5	factor	What is your primary goal for participation in the program? (Check All That Apply)
Q5a		Checked: Gain self confidence
Q5b		Checked: Start a company
Q5c		Checked: Networking
Q5d		Checked: Entrepreneurship training
Q5e		Checked: Attending seminars/workshops
Q5f		Checked: All of the above.
Q5g		Checked: Other
Q5h		Checked: Job/career opportunities (2016)
Q5i		Checked: Valuable knowledge and skills (2016)
Q5j		Checked: Interest in technology commercialization (2016)
Q5Other	character	Fill in the blank for "Other". (2014+)
Q7	factor	Do you have regular access to a computer? (Yes/No)
Q7a-f	factor	Do you have access to the following software? (2014)
Q7a		Checked: Internet
Q7b		Checked: Microsoft Word
Q7c		Checked: Excel
Q7d		Checked: PowerPoint
Q7e		Checked: Email
Q7f		Checked: Other
Q7g	character	Fill in the blank for "Other". (2014)
Q8	factor	Have you been involved with any new discoveries that have been patented by the University of Florida? (Yes/No)
Q8a	character	If you answered "Yes" to the previous question, please briefly describe the technology and your affiliation. (Ex: inventor, graduate student, post-doc, other)
Q9	character	Attach a copy of your Resume in PDF format. (Limit 3 pages.)

¹ These fields were added to aid in data analysis.

² These fields will be redacted in final data set.

****Notes:****

- Some of the records from the original data set contain duplicate data. These records were created when participants completed the application twice. The last application (Highest Entry ID #) submitted was retained for data analysis. The earlier submissions are marked as "Duplicate" in the full data set for reference. These will be removed prior to data analysis.
- It is also noted that for the for some years the "Entry ID" numbers do not start at #1. This could be data that was removed by the program organizers, or it could be the earlier entries were test data from testing the application from prior to publication.

Compiling the Data

The application data were provided in the form of an Excel spreadsheet. For some cohorts (2014 & 2015) there is a raw data spreadsheet as exported from the online application and a separate spreadsheet with additional information that was used in the admissions decision-making process. For other cohorts (2013, 2016), it appears as if the application export spreadsheet was edited to add information and document the decision-making process.

Notes:

- For 2012, the applications were collected on paper forms and e-mailed. Unfortunately, the 2012 forms have been lost and are not available for analysis.
- In some cases, information had to be compiled from other data sources to complete the data set.
- Team assignments and completion data were gathered and verified through the attendance worksheets. Teams were assigned an ID (A:H) so that they can be anonymized in the final data set. Team letter assignments were recorded on the original attendance spreadsheets. This portion of the data collection process was completed by hand using an Excel spreadsheet.
- Each cohort data was stored in an individual spreadsheet and then exported into a .csv file for import into R.

Preparing the Data for analysis

In this first R block, the individual cohort .csv data files are combined into a dataframe. Empty values are properly coded with "NA" and then duplicate records (rows) are removed from the dataset. Once all the dataframes were complete, they are combined together into a single dataframe. This dataframe is stored as 'Applicants.csv' for use in the quantitative analysis.

```
## Reading data and combining into one dataframe.  
## This block does not need to execute after initial data tidying.  
  
# Read Applicants data from cohort application files and remove observations  
# marked duplicate.  
Applicants12 <- read.csv("2012Applicants.csv", header=TRUE, sep=",", na.strings = c("", "NA"))
```

```

Applicants12 <- filter(Applicants12, Accepted != "Duplicate")

Applicants13 <- read.csv("2013Applicants.csv", header=TRUE, sep=";", na.strings = c("", "NA"))
Applicants13 <- filter(Applicants13, Accepted != "Duplicate")

Applicants14 <- read.csv("2014Applicants.csv", header=TRUE, sep=";", na.strings = c("", "NA"))
Applicants14 <- filter(Applicants14, Accepted != "Duplicate")

Applicants15 <- read.csv("2015Applicants.csv", header=TRUE, sep=";", na.strings = c("", "NA"))
Applicants15 <- filter(Applicants15, Accepted != "Duplicate")

Applicants16 <- read.csv("2016Applicants.csv", header=TRUE, sep=";", na.strings = c("", "NA"))
Applicants16 <- filter(Applicants16, Accepted != "Duplicate")

# Merge Applicants from individual cohort Applicants tables into one 'Applicants' table.
Applicants <- rbind(Applicants16, Applicants15)
Applicants <- rbind(Applicants, Applicants14)
Applicants <- rbind(Applicants, Applicants13)
Applicants <- rbind(Applicants, Applicants12)

str(Applicants)

```

Tidying the Data

After reviewing the data with 'str(Applicants)' it is apparent the factors are not consistent for all variables. This may be due to the fact that as the application form was edited, different spellings for various factors were used. This block cleans up the inconsistencies for each of the factors and shortens some of the factor labels so that they are easier to manipulate and display in tables.

```

## Cleaning up factor labels so that analysis will be consistent.
## This block does not need to execute after initial data tidying.

# Create degree indicators that are one word in length.
Applicants$Degree <- str_replace_all(Applicants$Degree, "GED or High school diploma", "HS")
Applicants$Degree <- str_replace_all(Applicants$Degree, "undergrad", "HS")
Applicants$Degree <- str_replace_all(Applicants$Degree, "High school graduate", "HS")
Applicants$Degree <- str_replace_all(Applicants$Degree, "Associate's degree", "Associate")
Applicants$Degree <- str_replace_all(Applicants$Degree, "A.A.", "Associate")
Applicants$Degree <- str_replace_all(Applicants$Degree, "Bachelor's degree", "Bachelor")
Applicants$Degree <- str_replace_all(Applicants$Degree, "B.A.", "Bachelor")

```

```

Applicants$Degree <- str_replace_all(Applicants$Degree, "B.S.", "Bachelor")
Applicants$Degree <- str_replace_all(Applicants$Degree, "B.F.A.", "Bachelor")
Applicants$Degree <- str_replace_all(Applicants$Degree, "Master's degree", "Master")
Applicants$Degree <- str_replace_all(Applicants$Degree, "M.S.", "Master")
Applicants$Degree <- str_replace_all(Applicants$Degree, "M.A.", "Master")
Applicants$Degree <- str_replace_all(Applicants$Degree, "MBA", "Master")
Applicants$Degree <- str_replace_all(Applicants$Degree, "M.B.A.", "Master")
Applicants$Degree <- str_replace_all(Applicants$Degree, "J.D.", "Master")
Applicants$Degree <- str_replace_all(Applicants$Degree, "Ph.D.", "Doctorate")
Applicants$Degree <- str_replace_all(Applicants$Degree, "PhD", "Doctorate")
Applicants$Degree <- factor(Applicants$Degree, levels=c("HS", "Associate", "Bachelor", "Master", "Doctorate"), ordered=TRUE)

#Update Entries for questions which are parsing into multiple factors
Applicants$Q5a <- str_replace_all(Applicants$Q5a, "Gain self confidence", "Gain self-confidence")
Applicants$Q5a <- factor(Applicants$Q5a)
Applicants$Q5f <- str_replace_all(Applicants$Q5f, "All of the above.", "All of the above")
Applicants$Q5f <- factor(Applicants$Q5f)
Applicants$Q8 <- str_replace_all(Applicants$Q8, "Yes (Please answer Question 11.)", "Yes")
Applicants$Q8 <- str_replace_all(Applicants$Q8, "Yes (Please answer Question 9.)", "Yes")

# Remove Duplicate factors and ensure variables are factors.
Applicants$Accepted <- factor(Applicants$Accepted, levels=c("Yes", "No"), ordered=TRUE)
Applicants$Decision <- factor(Applicants$Decision, levels=c("Yes", "No"), ordered=TRUE)
Applicants$Finished <- factor(Applicants$Finished, levels=c("Yes", "No"), ordered=TRUE)
Applicants$Q8 <- factor(Applicants$Q8)

```

Anonymizing the Data Set

The final data set has been cleansed to remove all identifying information so it is a truly anonymous data set for analysis. Only columns with respondent data will be included, all participant identifying information and all references to program name and university will be changed. The dataframe is saved as 'Applicants.csv'. For all future iterations of analysis, the data will be loaded from 'Applicants.csv', and previous blocks will not execute ('eval=FALSE'). This anonymized data set is the only version of the data that will be made available for analysis via GitHub.

****Notes:****

- All references to the program name, the university, and other identifiable indicators have been replaced with generic terms surrounded by asteriks. Ex. *program*,

university, company, etc. This process was completed manually in Excel by reading through applicant responses to find all identifying data and replacing it with generic placeholders.

```
# Choosing the columns to be included in the anonymized data set.
Applicants <- select(Applicants, Identifier, TeamID, Cohort, Accepted, Decision, Finished, Team, Degree, Experience, contains("Q"))

# Save the file for later analysis.
write.csv(Applicants, file="Applicants.csv")
save(Summative, file = "data/Summative.Rda")
```

Summative Evaluation

This code can be used to Tidy individual years, or the aggregated data. To analyze an individual year, comment out the lines that combine the data sets.

- CodeBook.xlsx contains the variable names (question numbers), the text of the corresponding question, and an inventory for which years the question appeared on the survey.
- Summative.csv contains the combined survey data.
- Individual files 2013Summative.csv through 2016Summative.csv were created to hold individual year data.
- The finished dataframe Summative.Rda has been exported for use in the analysis.

Compiling the Data

- For cohorts 2013 - 2015 the surveys were completed in paper and pencil format. A matching survey was created in Qualtrics and survey responses were hand entered and exported as a .csv file.
- For 2016, the survey results were collected in Survey Monkey, results were exported as a .csv file.
- Survey responses for 2012 are missing from the available data.

While many of the questions in the 2016 survey are identical to 2013 - 2015, the export from SurveyMonkey was substantially different. To prepare the data for use in this analysis, variable names had to be hand entered to match those from the Qualtrics import. Likert Scale responses all used the same 5 point scale, but were configured to use different indicators. These differences are noted in the code book.

Summative Data Code Book

```
# Read the data file.

# Cohort 2016 has 40 completers, and 42 surveys.
S2016 <- read.csv("./data/2016_Summative.csv", sep = ",", header = TRUE)
nrow(S2016)

## [1] 42
```

```

# Cohort 2015 has 47 completers, 5 missing surveys.
S2015 <- read.csv("./data/2015_Summative.csv", sep = ",", header = TRUE)
nrow(S2015)

## [1] 42

# Cohort 2014 has 42 completers, 8 missing surveys.
S2014 <- read.csv("./data/2014_Summative.csv", sep = ",", header = TRUE)
nrow(S2014)

## [1] 34

# Cohort 2013 has 41 completers, two did not attend 11/12 session, 6 missing
surveys.
S2013 <- read.csv("./data/2013_Summative.csv", sep = ",", header = TRUE)
nrow(S2013)

## [1] 33

# Convert rename column one and convert to character
colnames(S2013)[colnames(S2013) == "i.V1"] <- "V1"
colnames(S2014)[colnames(S2014) == "i.V1"] <- "V1"
colnames(S2015)[colnames(S2015) == "i.V1"] <- "V1"
colnames(S2016)[colnames(S2016) == "i.V1"] <- "V1"
S2013[,1] <- as.character(S2013[,1])
S2014[,1] <- as.character(S2014[,1])
S2015[,1] <- as.character(S2015[,1])
S2016[,1] <- as.character(S2016[,1])

# Review the data file variables.
# str(S2015)

# Read the code book.
CodeBook <- read.xlsx("./data/Summative_CodeBook.xlsx", sheetIndex=1, header
= TRUE)
# CodeBook = data.table(CodeBook)

# View the code book.
# head(CodeBook)

```

The following code block converts the numerical response for Question 6: "Who is your mentor?" to the team codes. These codes are assigned to maintain anonymity of teams and mentors. The 2016 Mentors were updated by hand due to the data being encoded using full text descriptions.

```

# Question 6 Factor: "Who was your mentor?"
# Note this question uses the TeamID which matches the TeamID in the applican
t.csv file.

# 2016 Mentors
# These were updated using Excel. The SurveyMonkey version of the datafile i

```

included all names and technologies. To maintain anonymity, they were updated before importing the data into this analysis.

2015 Mentors

```
S2015$Q6[S2015$Q6 == "1"] <- "2015TF"
S2015$Q6[S2015$Q6 == "2"] <- "2015TG"
S2015$Q6[S2015$Q6 == "3"] <- "2015TD"
S2015$Q6[S2015$Q6 == "4"] <- "2015TA"
S2015$Q6[S2015$Q6 == "5"] <- "2015TC"
S2015$Q6[S2015$Q6 == "6"] <- "2015TB"
S2015$Q6[S2015$Q6 == "7"] <- "2015TU" # This is unknown in the survey. n=0
S2015$Q6[S2015$Q6 == "8"] <- "2015TE"
S2015$Q6 = factor(S2015$Q6, levels=c("2015TA", "2015TB", "2015TC", "2015TD", "2015TE", "2015TF", "2015TG", "2015TU"), ordered=TRUE)
```

2014 Mentors

```
S2014$Q6[S2014$Q6 == "1"] <- "2014TA"
S2014$Q6[S2014$Q6 == "2"] <- "2014TG"
S2014$Q6[S2014$Q6 == "3"] <- "2014TF"
S2014$Q6[S2014$Q6 == "4"] <- "2014TB"
S2014$Q6[S2014$Q6 == "5"] <- "2014TC"
S2014$Q6[S2014$Q6 == "6"] <- "2014TD"
S2014$Q6[S2014$Q6 == "7"] <- "2014TU" # This is unknown in the survey. n=0
S2014$Q6[S2014$Q6 == "8"] <- "2014TE"
S2014$Q6 = factor(S2014$Q6, levels=c("2014TA", "2014TB", "2014TC", "2014TD", "2014TE", "2014TF", "2014TG", "2014TU"), ordered=TRUE)
```

2013 Mentors

```
S2013$Q6[S2013$Q6 == "1"] <- "2013TD"
S2013$Q6[S2013$Q6 == "2"] <- "2013TC"
S2013$Q6[S2013$Q6 == "3"] <- "2013TA"
S2013$Q6[S2013$Q6 == "4"] <- "2013TG"
S2013$Q6[S2013$Q6 == "5"] <- "2013TB"
S2013$Q6[S2013$Q6 == "6"] <- "2013TF"
S2013$Q6[S2013$Q6 == "7"] <- "2013TE" # This is unknown in the survey. n=0
S2013$Q6[S2013$Q6 == "8"] <- "2013TU"
S2013$Q6 = factor(S2013$Q6, levels=c("2013TA", "2013TB", "2013TC", "2013TD", "2013TE", "2013TF", "2013TG", "2013TU"), ordered=TRUE)
```

Combine the individual survey response files into one complete Summative dataframe. This will allow cumulative data analysis as well as comparisons across cohorts.

Combine files into one Summative dataframe

```
Summative <- bind_rows(S2015, S2014)
```

```
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
```

```
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
```

```

## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character

Summative <- bind_rows(Summative, S2013)

```

The following code block converts the numerical response items into factor response items that will be easier to analyze. This block only affects 2013 - 2015 data as 2016 already has the factored response items for these questions.

```

# Question 20 Factor: "Time allotted each week for speakers was:"
Summative$Q13[Summative$Q13 == "1"] <- "Too Short"
Summative$Q13[Summative$Q13 == "2"] <- "About Right"
Summative$Q13[Summative$Q13 == "3"] <- "Too Long"
Summative$Q13 = factor(Summative$Q13,levels=c("Too Short","About Right","Too Long"), ordered=TRUE)

# Question 14 Factor: "Time allotted each week for teamwork was:"
Summative$Q14[Summative$Q14 == "1"] <- "Too Short"
Summative$Q14[Summative$Q14 == "2"] <- "About Right"
Summative$Q14[Summative$Q14 == "3"] <- "Too Long"
Summative$Q14 = factor(Summative$Q14,levels=c("Too Short","About Right","Too Long"), ordered=TRUE)

# Question 19 Factor: "How many hours a week on average did your team meet outside of the program?"
Summative$Q19[Summative$Q19 == "1"] <- "1-2 hrs"
Summative$Q19[Summative$Q19 == "2"] <- "1-2 hrs"
Summative$Q19[Summative$Q19 == "3"] <- "3-5 hrs"

```

```

Summative$Q19[Summative$Q19 == "4"] <- "3-5 hrs"
Summative$Q19[Summative$Q19 == "5"] <- "More than 5 hrs"
Summative$Q19 = factor(Summative$Q19,levels=c("1-2 hrs","2-3 hrs","3-4 hrs",
"4-5 hrs", "More than 5 hrs"), ordered=TRUE)

# Question 20 Factor: "The programs duration was:"
Summative$Q20[Summative$Q20 == "1"] <- "Too Short"
Summative$Q20[Summative$Q20 == "2"] <- "About Right"
Summative$Q20[Summative$Q20 == "3"] <- "Too Long"
Summative$Q20 = factor(Summative$Q20,levels=c("Too Short","About Right","Too
Long"), ordered=TRUE)

# Question 21 integer: Convert to range of values
Summative$Q21[Summative$Q21 <= "2"] <- "1-2 hrs"
Summative$Q21[Summative$Q21 <= "5"] <- "3-5 hrs"
Summative$Q21[Summative$Q21 >= "6"] <- "More than 5 hrs"
Summative$Q21 = factor(Summative$Q21,levels=c("1-2 hrs", "3-5 hrs", "More tha
n 5 hrs"), ordered=TRUE)

# Question 22 Factor: "Would you recommend this program to other women?"
Summative$Q22[Summative$Q22 == "1"] <- "Yes"
Summative$Q22[Summative$Q22 == "2"] <- "No"
Summative$Q22[Summative$Q22 == "3"] <- "Unsure"
Summative$Q22 = factor(Summative$Q22,levels=c("Yes","No","Unsure"), ordered=
TRUE)

# Question 24 Factor: "What is your highest level of education completed?"
Summative$Q24[Summative$Q24 == "1"] <- "HS"
Summative$Q24[Summative$Q24 == "2"] <- "Associate"
Summative$Q24[Summative$Q24 == "3"] <- "Bachelor"
Summative$Q24[Summative$Q24 == "4"] <- "Master"
Summative$Q24[Summative$Q24 == "5"] <- "PhD"
Summative$Q24[Summative$Q24 == "6"] <- "Other"
Summative$Q24 = factor(Summative$Q24,levels=c("HS","Associate","Bachelor", "M
aster", "PhD", "Other" ), ordered=TRUE)

# Question 29 Factor: "What is your area of expertise?"
Summative$Q29[Summative$Q29 == "1"] <- "Finance"
Summative$Q29[Summative$Q29 == "2"] <- "Business"
Summative$Q29[Summative$Q29 == "3"] <- "Science"
Summative$Q29[Summative$Q29 == "4"] <- "Engineering"
Summative$Q29[Summative$Q29 == "5"] <- "Computer/IT"
Summative$Q29[Summative$Q29 == "6"] <- "Marketing/Communications/Design"
Summative$Q29[Summative$Q29 == "7"] <- "Other"
Summative$Q29 = factor(Summative$Q29,levels=c("Finance","Business","Science",
"Engineering", "Computer/IT", "Marketing/Communications/Design", "Other" ),
ordered=TRUE)

# Question 30 Factor: "What is your age?"
Summative$Q30[Summative$Q30 == "1"] <- "18-24"

```

```

Summative$Q30[Summative$Q30 == "2"] <- "25-34"
Summative$Q30[Summative$Q30 == "3"] <- "35-44"
Summative$Q30[Summative$Q30 == "4"] <- "45-54"
Summative$Q30[Summative$Q30 == "5"] <- "55-64"
Summative$Q30[Summative$Q30 == "7"] <- "65-74"
Summative$Q30[Summative$Q30 == "6"] <- "75 or older"
Summative$Q30 = factor(Summative$Q30,levels=c("18-24","25-34","35-44", "45-54", "55-64", "75 or older"), ordered=TRUE)

```

Question 31 Factor: "Choose the answer that best describes your current situation:"

```

Summative$Q31[Summative$Q31 == "1"] <- "married or in a committed relationship with no children"
Summative$Q31[Summative$Q31 == "2"] <- "married or in a committed relationship with grown children (18+)"
Summative$Q31[Summative$Q31 == "3"] <- "married or in a committed relationship with school aged children (5-18)"
Summative$Q31[Summative$Q31 == "4"] <- "married or in a committed relationship with younger child/ren (under 5)"
Summative$Q31[Summative$Q31 == "5"] <- "single with no children"
Summative$Q31[Summative$Q31 == "6"] <- "single parent with grown children (18+)"
Summative$Q31[Summative$Q31 == "7"] <- "single parent with school aged children (5-18)"
Summative$Q31[Summative$Q31 == "7"] <- "single parent with younger child/ren (under 5)"
Summative$Q31 = factor(Summative$Q31, ordered=TRUE)

```

Question 32 Factor: "Which of the following best represents your racial or ethnic heritage?"

```

Summative$Q32[Summative$Q32 == "1"] <- "Non-Hispanic White or Euro-American"
Summative$Q32[Summative$Q32 == "2"] <- "Black, Afro-Caribbean, or African American"
Summative$Q32[Summative$Q32 == "3"] <- "Latino or Hispanic American"
Summative$Q32[Summative$Q32 == "4"] <- "East Asian or Asian American"
Summative$Q32[Summative$Q32 == "5"] <- "South Asian or Indian American"
Summative$Q32[Summative$Q32 == "6"] <- "Middle Eastern or Arab American"
Summative$Q32[Summative$Q32 == "7"] <- "Native American or Alaskan Native"
Summative$Q32[Summative$Q32 == "8"] <- "Other"
Summative$Q32 = as.factor(Summative$Q32)

```

Question 33 Factor: "What was your total household income before taxes during the past 12 months?"

```

Summative$Q33[Summative$Q33 == "1"] <- "Less than $25,000"
Summative$Q33[Summative$Q33 == "2"] <- "$25,000 to $34,999"
Summative$Q33[Summative$Q33 == "3"] <- "$35,000 to $49,999"
Summative$Q33[Summative$Q33 == "4"] <- "$50,000 to $74,999"
Summative$Q33[Summative$Q33 == "5"] <- "$75,000 to $99,999"
Summative$Q33[Summative$Q33 == "6"] <- "$100,000 to $149,999"
Summative$Q33[Summative$Q33 == "7"] <- "$150,000 or more"

```

```

Summative$Q33 = factor(Summative$Q33, levels=c("Less than $25,000", "$25,000
to $34,999", "$35,000 to $49,999", "$50,000 to $74,999", "$75,000 to $99,999"
, "$100,000 to $149,999", "$150,000 or more"), ordered=TRUE)

# Question 34 Factor: "Please circle the option(s) that best describe(s) your
current situation. Ok to choose more than one if applicable."
Summative$Q34[Summative$Q34 == "1"] <- "Master's student"
Summative$Q34[Summative$Q34 == "2"] <- "MBA student"
Summative$Q34[Summative$Q34 == "3"] <- "MD student"
Summative$Q34[Summative$Q34 == "4"] <- "PhD student"
Summative$Q34[Summative$Q34 == "5"] <- "Postdoc"
Summative$Q34[Summative$Q34 == "6"] <- "Unemployed (not a student)"
Summative$Q34[Summative$Q34 == "7"] <- "Work part-time (not a student)"
Summative$Q34[Summative$Q34 == "8"] <- "Employed at a technology startup"
Summative$Q34[Summative$Q34 == "9"] <- "Employed at a non-technology startup"
Summative$Q34[Summative$Q34 == "10"] <- "Employed at a technology non-startup
company"
Summative$Q34[Summative$Q34 == "11"] <- "Employed at a non-technology non-sta
rtup company"
Summative$Q34[Summative$Q34 == "12"] <- "Owned my own technology business"
Summative$Q34[Summative$Q34 == "13"] <- "Owned my own non-technology business
"
Summative$Q33 = as.factor(Summative$Q33)

# Update Likert scale questions to represent NA as NA (Qualtrics exported it
as #6)

Summative$Q1_1[Summative$Q1_1 == "6"] <- NA
Summative$Q4_1[Summative$Q4_1 == "6"] <- NA
Summative$Q7_1[Summative$Q7_1 == "6"] <- NA
Summative$Q7_2[Summative$Q7_2 == "6"] <- NA
Summative$Q7_3[Summative$Q7_3 == "6"] <- NA
Summative$Q9_1[Summative$Q9_1 == "6"] <- NA
Summative$Q9_2[Summative$Q9_2 == "6"] <- NA
Summative$Q9_3[Summative$Q9_3 == "6"] <- NA
Summative$Q9_4[Summative$Q9_4 == "6"] <- NA
Summative$Q9_5[Summative$Q9_5 == "6"] <- NA

# Add 2016 data to Summarize
Summative <- bind_rows(Summative, S2016)

## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to characte
r

## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to characte
r

## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to characte
r

```

```

## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character
## Warning in bind_rows_(x, .id): Unequal factor levels: coercing to character

# Rename ID Column
Summative <- rename(Summative, ID = V1)

# Rename Cohort column and factor
Summative <- rename(Summative, Cohort = Q1)
Summative$Cohort <- factor(Summative$Cohort, levels=c("2013", "2014", "2015",
"2016"), ordered=TRUE)

# Rename Degree column and clean up factor levels
Summative <- rename(Summative, Degree = Q24)
Summative$Degree[Summative$Degree == "High School Diploma"] <- "HS"
Summative$Degree[Summative$Degree == "Master's Degree"] <- "Master"
Summative$Degree[Summative$Degree == "Bachelor's Degree"] <- "Bachelor"
Summative$Degree[Summative$Degree == "Ph.D."] <- "PhD"
Summative$Degree = factor(Summative$Degree, levels=c("HS", "Associate", "Bachelor",
"Master", "PhD", "Other" ), ordered=TRUE)

# Rename Team Column, Survey ID, Age, Race, Income, Relationship
Summative <- rename(Summative, Team = Q6)
Summative <- rename(Summative, PaperID = Q25)
Summative <- rename(Summative, Discipline = Q29)
Summative <- rename(Summative, Age = Q30)
Summative <- rename(Summative, Relationship = Q31)
Summative <- rename(Summative, Race = Q32)
Summative <- rename(Summative, Income = Q33)
Summative <- rename(Summative, Employment = Q34)

# Rename Questions. Use TEXT to identify open-ended response items.
Summative <- rename(Summative, Q1 = Q1_1)
Summative <- rename(Summative, Q4 = Q4_1)
Summative <- rename(Summative, TEXT2 = Q2)
Summative <- rename(Summative, TEXT5 = Q5)
Summative <- rename(Summative, TEXT8 = Q8)
Summative <- rename(Summative, TEXT10 = Q10)
Summative <- rename(Summative, TEXT12 = Q12)

```

```
Summative <- rename(Summative, TEXT35 = Q35)
Summative <- rename(Summative, TEXT17 = Q17)
Summative <- rename(Summative, TEXT23 = Q23)
Summative <- rename(Summative, TEXT24 = Q24_TEXT)
Summative <- rename(Summative, TEXT26 = Q26)
Summative <- rename(Summative, TEXT29 = Q29_TEXT)

# Saving the data for later analysis.
write.csv(Summative, file="data/Summative.csv")
save(Summative, file = "data/Summative.Rda")
```

REFERENCES

- Acker, J. (1992), "Gendering organizational theory", *Classics of organizational theory*, Vol. 6 No., pp. 450-459.
- Ahl, H. (2006), "Why research on women entrepreneurs needs new directions", *Entrepreneurship Theory and Practice*, Vol. 30 No. 5, pp. 595-621.
- Ahl, H. & Marlow, S. (2012), "Exploring the dynamics of gender, feminism and entrepreneurship: Advancing debate to escape a dead end?", *Organization*, Vol. 19 No. 5, pp. 543-562.
- Ajzen, I. (1991), "The theory of planned behavior", *Organizational behavior and human decision processes*, Vol. 50 No. 2, pp. 179-211.
- Armitage, C. J. & Conner, M. (2001), "Efficacy of the theory of planned behaviour: A meta-analytic review", *British journal of social psychology*, Vol. 40 No. 4, pp. 471-499.
- Ashcraft, C. & Blithe, S. (2009), *Women in it: The facts: National Council of Women & Information Technology*.
- Ashcraft, C. & Breitzman, A. (2012), Who invents it? Women's participation in information technology patenting: 2012 update, *In: HAMILTON, S. & BRADEBERRY, A. (eds.)*, Boulder, Colorado: National Center for Women & Information Technology (NCWIT).
- Barker, L., Mancha, C. & Ashcraft, C. (2014), *What is the impact of gender diversity on technology business performance?*, Colorado Springs, CO: National Council of Women & Information Technology.
- Berndt, T. J. & Heller, K. A. (1986), "Gender stereotypes and social inferences: A developmental study", *Journal of personality and social psychology*, Vol. 50 No. 5, pp. 889.
- Bliemel, M. J. (2014), "Getting entrepreneurship education out of the classroom and into students' heads", *Entrepreneurship Research Journal*, Vol. 4 No. 2, pp. 237-260.
- Boone Jr, H. N. & Boone, D. A. (2012), "Analyzing likert data", *Journal of extension*, Vol. 50 No. 2, pp. n2.
- Broverman, I. K., Vogel, S. R., Broverman, D. M., Clarkson, F. E. & Rosenkrantz, P. S. (1972), "Sex-role stereotypes: A current appraisal", *Journal of Social issues*, Vol. 28 No. 2, pp. 59-78.
- Browne, J. (2007), *The future of gender*, Cambridge University Press, New York, NY.

- Bruni, A., Gherardi, S. & Poggio, B. (2004a), "Doing gender, doing entrepreneurship: An ethnographic account of intertwined practices", *Gender, Work and Organization*, Vol. 11 No. 4, pp. 406-429.
- Bruni, A., Gherardi, S. & Poggio, B. (2004b), *Gender and entrepreneurship: An ethnographic approach*, Routledge, London and New York.
- Brush, C. G., Greene, P. G., Balachandra, L. & Davis, A. E. (2014), Women entrepreneurs 2014: Bridging the gender gap in venture capital, Babson Park, Massachusetts: Babson College.
- Cabrera, E. M. & Mauricio, D. (2017), "Factors affecting the success of women's entrepreneurship: A review of literature", *International Journal of Gender and Entrepreneurship*, Vol. 9 No. 1, pp. 31-65.
- Calás, M. B. & Smircich, L. (2009), "Feminist perspectives on gender in organizational research: What is and is yet to be", *The Sage handbook of organizational research methods*, Vol. No., pp. 246-269.
- Calas, M. B., Smircich, L. & Bourne, K. A. (2009), "Extending the boundaries: Reframing "entrepreneurship as social change" through feminist perspectives", *Academy of Management Review*, Vol. 34 No. 3, pp. 552-569.
- Canning, J., Haque, M. & Wang, Y. (2012), Women at the wheel: Do female executives drive start-up success?, *In: FOO*, V. (ed.): Dow Jones Venture Source.
- Cejka, M. A. & Eagly, A. H. (1999), "Gender-stereotypic images of occupations correspond to the sex segregation of employment", *Personality and social psychology bulletin*, Vol. 25 No. 4, pp. 413-423.
- Cheryan, S., Drury, B. J. & Vichayapai, M. (2012), "Enduring influence of stereotypical computer science role models on women's academic aspirations", *Psychology of Women Quarterly*, Vol. No., pp. 0361684312459328.
- Cheryan, S., Master, A. & Meltzoff, A. N. (2015), "Cultural stereotypes as gatekeepers: Increasing girls' interest in computer science and engineering by diversifying stereotypes", *Frontiers in psychology*, Vol. 6 No., pp.
- Cheryan, S., Meltzoff, A. N. & Kim, S. (2011), "Classrooms matter: The design of virtual classrooms influences gender disparities in computer science classes", *Computers & Education*, Vol. 57 No. 2, pp. 1825-1835.
- Cheryan, S., Plaut, V. C., Davies, P. G. & Steele, C. M. (2009), "Ambient belonging: How stereotypical cues impact gender participation in computer science", *Journal of personality and social psychology*, Vol. 97 No. 6, pp. 1045-1060.

- Corbett, C. & Hill, C. (2012), *Graduating to a pay gap: The earnings of women and men one year after college graduation*, Washington, DC: American Association of University Women.
- Creswell, J. W. (2013), *Research design: Qualitative, quantitative, and mixed methods approaches*, Sage publications.
- Creswell, J. W. & Clark, V. L. P. (2011), *Designing and conducting mixed methods research*, SAGE California.
- Denavas-Walt, C. & Proctor, B. D. (2015), *Income and poverty in the united states*, Washington, DC: US Department of Commerce, US Census Bureau.
- Dewey, J. (1917), *Democracy and education: An introduction to the philosophy of education*, Macmillan Press Limited.
- Dewey, J. (1938), *Experience and education* Touchtone, New York, NY.
- Dey, J. G. & Hill, C. (2007), *Behind the pay gap*: ERIC.
- Doyle, J. A. & Paludi, M. A. (1991), *Sex and gender: The human experience*, William C. Brown.
- Eagly, A. H. (1987), "Reporting sex differences", *American Psychologist*, Vol. 42 No. 7, pp. 756-757.
- Eagly, A. H. (2013), *Sex differences in social behavior: A social-role interpretation*, Psychology Press.
- Eagly, A. H., Wood, W. & Diekmann, A. B. (2000), "Social role theory of sex differences and similarities: A current appraisal", *The developmental social psychology of gender*, 123-174.
- Eveleth, R. (2016), *The inherent bias of facial recognition*, Motherboard. Vice Media LLC.
- Ewits (2015), *Training manual for program coordinators*, University of Florida Office of Technology Licensing, Gainesville, FL.
- Ewits (2017a), *Ewits participant workbook*, University of Florida Office of Technology Licensing, Gainesville, FL.
- Ewits (2017b), "Ewits website", available at: ewits.org (accessed 5 September 2017).
- Fausto-Sterling, A. (1992), *Myths of gender: Biological theories about women and men*, Basic Books.

- Finamore, J. & Khan, B. (2015), Characteristics of the college-educated population and the science and engineering workforce in the united states, Washington, DC: National Center for Science and Engineering Statistics.
- Fink, S. & Haisley, E. (2015), Shattering stereotypes: Women in entrepreneurship, London, England: Centre for Entrepreneurs, Barclays.
- Fussell, S. (2016), The alarming downsides to tech industry diversity reports, *Gizmodo*.
- García, M.-C. D. & Welter, F. (2013), "Gender identities and practices: Interpreting women entrepreneurs' narratives", *International Small Business Journal*, Vol. 31 No. 4, pp. 384-404.
- Gilpin, L. 2015. How venture capital must change: Gender equality as a business opportunity. Available from: <http://www.techrepublic.com/article/how-venture-capital-must-change-gender-equality-as-a-business-opportunity/> [Accessed August 31, 2015 2015].
- Gompers, P. A. & Wang, S. Q. (2017), Diversity in innovation: Working paper 17-067, Boston, MA: Harvard Business School.
- Harkinson, J. (2014), "Silicon valley firms are even whiter and more male than you thought", Mother Jones: Mother Jones, available at: <http://www.motherjones.com/media/2014/05/google-diversity-labor-gender-race-gap-workers-silicon-valley> (accessed February 29, 2016).
- Henry, C., Foss, L. & Ahl, H. (2016), "Gender and entrepreneurship research: A review of methodological approaches", *International Small Business Journal*, Vol. 34 No. 3, pp. 217-241.
- Henry, C., Foss, L., Fayolle, A., Walker, E. & Duffy, S. (2015), "Entrepreneurial leadership and gender: Exploring theory and practice in global contexts", *Journal of Small Business Management*, Vol. No., pp.
- Hill, C. (2016), The simple truth about the gender pay gap, Washington, DC: American Association of University Women.
- Hill, C. & Corbett, C. (2015), Solving the equation: The variables for women's success in engineering and computing, Washington, DC: American Association of University Women.
- Hindle, K., Klyver, K. & Jennings, D. F. (2009), "An "informed" intent model: Incorporating human capital, social capital, and gender variables into the theoretical model of entrepreneurial intentions", *Understanding the entrepreneurial mind*, Springer, 35-50.
- Hoffman, C. & Hurst, N. (1990), "Gender stereotypes: Perception or rationalization?", *Journal of personality and social psychology*, Vol. 58 No. 2, pp. 197.

- Jost, J. T. & Banaji, M. R. (1994), "The role of stereotyping in system-justification and the production of false consciousness", *British journal of social psychology*, Vol. 33 No. 1, pp. 1-27.
- Kuschel, K. & Lepeley, M.-T. (2016), "Women start-ups in technology: Literature review and research agenda to improve participation", *International Journal of Entrepreneurship and Small Business*, Vol. 27 No. 2-3, pp. 333-346.
- Labor, U. S. D. O. (2014), 2014 labor statistics, *In: LABOR, U. S. D. O. (ed.)*, Washington, D.C.: U.S. Department of Labor, Bureau of Labor Statistics.
- Liñán, F. & Chen, Y. W. (2009), "Development and cross-cultural application of a specific instrument to measure entrepreneurial intentions", *Entrepreneurship Theory and Practice*, Vol. 33 No. 3, pp. 593-617.
- Mangiafico, S. S. (2016), *Summary and analysis of extension program evaluation in r.*
- Marlow, S. (2002), "Women and self-employment: A part of or apart from theoretical construct?", *The International Journal of Entrepreneurship and Innovation*, Vol. 3 No. 2, pp. 83-91.
- Merriam, S. B. (1988), *Case study research in education: A qualitative approach*, Jossey-Bass.
- Merriam, S. B. & Tisdell, E. J. (2015), *Qualitative research: A guide to design and implementation*, John Wiley & Sons.
- Mertens, D. M. (2012), "Transformative mixed methods addressing inequities", *American Behavioral Scientist*, Vol. 56 No. 6, pp. 802-813.
- Naples, N. A. (2007), "Feminist methodology", *The Wiley Blackwell Encyclopedia of Gender and Sexuality Studies*, Vol. No., pp.
- Norman, G. (2010), "Likert scales, levels of measurement and the "laws" of statistics", *Advances in health sciences education*, Vol. 15 No. 5, pp. 625-632.
- Nsf (2017), *Women, minorities, and persons with disabilities in science and engineering*, Washington, D.C.: National Science Institute.
- Piperopoulos, P. & Dimov, D. (2015), "Burst bubbles or build steam? Entrepreneurship education, entrepreneurial self-efficacy, and entrepreneurial intentions", *Journal of Small Business Management*, Vol. 53 No. 4, pp. 970-985.
- Ramazanoglu, C. & Holland, J. (2002), *Feminist methodology: Challenges and choices*, Sage.
- Rhode, D. L. (2017), "20. Gender stereotypes and unconscious bias", *Handbook of research on gender and leadership*, 316.

- Rideout, E. C. & Gray, D. O. (2013), "Does entrepreneurship education really work? A review and methodological critique of the empirical literature on the effects of university-based entrepreneurship education", *Journal of Small Business Management*, Vol. 51 No. 3, pp. 329-351.
- Santos, F. J., Roomi, M. A. & Liñán, F. (2016), "About gender differences and the social environment in the development of entrepreneurial intentions", *Journal of Small Business Management*, Vol. 54 No. 1, pp. 49-66.
- Seidman, I. (2013), *Interviewing as qualitative research*, Teachers College Press, New York and London.
- Shane, S. & Venkataraman, S. (2000), "The promise of entrepreneurship as a field of research", *Academy of Management Review*, Vol. 25 No. 1, pp. 217-226.
- Shapero, A. & Sokol, L. (1982), "The social dimensions of entrepreneurship", *Encyclopedia of entrepreneurship*, Vol. No., pp. 72-90.
- Steele, C. M. (1997), "A threat in the air: How stereotypes shape intellectual identity and performance", *American Psychologist*, Vol. 52 No. 6, pp. 613.
- Steele, C. M. (2011), *Whistling vivaldi: How stereotypes affect us and what we can do (issues of our time)*, WW Norton & Company.
- Swim, J. K. (1994), Perceived versus meta-analytic effect sizes: An assessment of the accuracy of gender stereotypes: American Psychological Association.
- Teare, G. & Desmond, N. 2015. Female founders on an upward trend, according to crunchbase. *TechCrunch* [Online]. Available from: <http://techcrunch.com/2015/05/26/female-founders-on-an-upward-trend-according-to-crunchbase/#.2ukz4a:XLKi> 2015].
- Teddlie, C. & Tashakkori, A. (2009), *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences*, Sage Publications Inc.
- Turner, J. C., Hogg, M. A., Oakes, P. J., Reicher, S. D. & Wetherell, M. S. (1987), *Rediscovering the social group: A self-categorization theory*, Basil Blackwell.
- Williams, J. E. & Best, D. L. (1990), *Measuring sex stereotypes: A multination study*, rev, Sage Publications, Inc.
- Womenable (2014), The 2014 state of women-owned businesses report: American Express Open.
- Yadav, V. & Unni, J. (2016), "Women entrepreneurship: Research review and future directions", *Journal of Global Entrepreneurship Research*, Vol. 6 No. 1, pp. 12.

Yang, T. & Aldrich, H. E. (2014), "Who's the boss? Explaining gender inequality in entrepreneurial teams", *American Sociological Review*, Vol. 79 No. 2, pp. 303-327.

Zanna, M. P. & Pack, S. J. (1975), "On the self-fulfilling nature of apparent sex differences in behavior", *Journal of Experimental Social Psychology*, Vol. 11 No. 6, pp. 583-591.

BIOGRAPHICAL SKETCH

Cheryl Calhoun currently serves as the Dean of Educational Centers and Director of the Blount Center for Santa Fe College. Her career includes over 25 years as a professor, systems analyst, and a community organizer. Her community involvement includes co-owning Wild Iris Books, serving as the founding director of Protect Gainesville Citizens, as well as serving on numerous advisory boards. She is Co-Chair of the Academic Alliance for the National Council of Women and Information Technology (NCWIT) and serves on the Academic Advisory Council for the Anita Borg Institute. Her academic preparation includes a B.S. in Food and Resource Economics (Computer Science minor), a MBA (Decision and Information Science), both from the University of Florida, and a graduate certificate in Information Assurance from the University of Illinois Springfield. She is a lifelong learner as can be evidenced by her return to UF after a 20-year hiatus to complete a PhD in Curriculum & Instruction (Educational Technologies). She graduated in December 2017. Her research interests include women's participation in technology entrepreneurship and effective utilization of online and web enhanced collaborative learning environments.