“I Can Be There One Day”: Learning and Leadership Development in a Community of Self-Identified Women in Technology

by

Melissa Hamer
BA, University of Victoria, 2012

A Thesis Submitted in Partial Fulfillment
of the Requirements for the Degree of

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Abstract

Women’s underrepresentation in the technology industry is a relevant and timely issue. The increasing use of technology and its expansion into our daily lives demand greater technical literacy and skills. Despite its growth, the industry remains male-dominated; fewer than 9% of executive officers and directors in Canadian technology companies are women (Macdougall et al., 2017). Researchers have linked women’s underrepresentation in technology leadership to the ‘chilly climate’ in technology spaces and a ‘leaky pipeline’ of women leaving the fields throughout their career (Prescott & Bogg, 2014b; Vitores & Gil-Juárez, 2016; Wynn & Correll, 2018). This research explores how a community can support learning and leadership development for women in technology. This case study examined the women’s experiences in YYJ Tech Ladies and their accounts of underrepresentation in technology, learning, and leadership. Their stories and reflections indicated that a community for women could create a safe space, sense of belonging, knowledge-sharing, and consciousness-raising. This study highlights the importance of community in facilitating women’s learning and confidence, essential factors for addressing experiences in male-dominated environments and supporting women’s career and leadership development.

Keywords: community, women, technology, leadership, learning, professional development, collective learning
Table of Contents

Supervisory Committee ........................................................................................................ ii
Abstract .................................................................................................................................. iii
Table of Contents .................................................................................................................... iv
List of Tables .......................................................................................................................... vi
List of Figures ........................................................................................................................ vii
Acknowledgments .................................................................................................................. viii
Chapter 1: Introduction ........................................................................................................ 1
  What is the Context of This Research? ............................................................................... 2
    How is this research personally significant? ............................................................... 2
    How does my positionality shape this research? ......................................................... 4
  Intersecting Theoretical Approaches ........................................................................... 5
    What is social constructionism? ................................................................................. 5
    What is critical pedagogy? ......................................................................................... 6
    What is feminist pedagogy? ..................................................................................... 6
  Integrating Theory and Practice ................................................................................... 7
    Research questions ................................................................................................. 8
Chapter 2: Literature Review .............................................................................................. 10
  What Are Women’s Experiences in Technology? ....................................................... 10
    What is a ‘chilly climate’? ...................................................................................... 10
    What is the ‘leaky pipeline’ metaphor? ..................................................................... 12
    What barriers do women face? .............................................................................. 14
  How Can We Support Women? ................................................................................. 15
    View women’s experiences in technology holistically ........................................... 15
    Prioritize role models and mentors ....................................................................... 16
    Focus on informal and non-formal learning .......................................................... 18
    Develop communities of practice ....................................................................... 19
Chapter 3: Methodology ..................................................................................................... 22
  Why a Case Study? ........................................................................................................ 22
    What is a case study? ............................................................................................ 22
    Why is a case study suitable for this research? ..................................................... 23
    How does this research draw on a case study methodology? ................................ 23
  Methods for Practicing Critical Pedagogy and Feminist Pedagogy ....................... 24
    Focus groups ........................................................................................................ 24
    Journal entries .................................................................................................... 27
  Reflecting as a Researcher ......................................................................................... 28
  Data ............................................................................................................................ 29
    How were participants recruited? ....................................................................... 29
    How did I analyze the data? ............................................................................... 30
Chapter 4: Findings ............................................................................................................ 31
  Experiences in Technology ......................................................................................... 32
    Seeing women’s underrepresentation and being the “only woman” ..................... 32
    Awareness of privilege and responsibility to support others ................................ 34
    Learning in a Community ..................................................................................... 35
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitions of learning and professional development</td>
<td>35</td>
</tr>
<tr>
<td>Connection to community</td>
<td>36</td>
</tr>
<tr>
<td>A “safe space” to learn</td>
<td>39</td>
</tr>
<tr>
<td>Safety in online environments</td>
<td>41</td>
</tr>
<tr>
<td>Support</td>
<td>42</td>
</tr>
<tr>
<td>Advice and knowledge-sharing</td>
<td>44</td>
</tr>
<tr>
<td>Examples of supportive interactions from the focus groups and journal entries</td>
<td>46</td>
</tr>
<tr>
<td>Access to information and resources</td>
<td>50</td>
</tr>
<tr>
<td>Examples of resources the women used to learn</td>
<td>51</td>
</tr>
<tr>
<td>Role models and mentors</td>
<td>51</td>
</tr>
<tr>
<td>Becoming role models and mentors</td>
<td>53</td>
</tr>
<tr>
<td>Challenges to Learning and Leadership Development</td>
<td>54</td>
</tr>
<tr>
<td>Workplace support</td>
<td>54</td>
</tr>
<tr>
<td>Fast-paced nature of technology</td>
<td>56</td>
</tr>
<tr>
<td>Finding reliable resources</td>
<td>57</td>
</tr>
<tr>
<td>Self-direction</td>
<td>59</td>
</tr>
<tr>
<td>Summary of Findings</td>
<td>61</td>
</tr>
<tr>
<td>Chapter 5: Discussion, Interpretations, and Conclusion</td>
<td>63</td>
</tr>
<tr>
<td>How Did YYJ Tech Ladies Contribute to Women’s Learning and Leadership Development</td>
<td>63</td>
</tr>
<tr>
<td>Building Community</td>
<td>63</td>
</tr>
<tr>
<td>Creating safe spaces</td>
<td>63</td>
</tr>
<tr>
<td>Facilitating collective learning</td>
<td>66</td>
</tr>
<tr>
<td>Creating Change</td>
<td>68</td>
</tr>
<tr>
<td>Consciousness-raising through stories and experiences</td>
<td>69</td>
</tr>
<tr>
<td>Supporting women’s leadership development</td>
<td>70</td>
</tr>
<tr>
<td>Significance</td>
<td>72</td>
</tr>
<tr>
<td>Future Research</td>
<td>73</td>
</tr>
<tr>
<td>Bibliography</td>
<td>75</td>
</tr>
<tr>
<td>Appendix A: Recruitment Materials</td>
<td>86</td>
</tr>
<tr>
<td>Appendix B: Participant Consent Form</td>
<td>88</td>
</tr>
<tr>
<td>Appendix C: Data Collection Methods</td>
<td>91</td>
</tr>
<tr>
<td>Appendix D: Thematic Analysis Maps</td>
<td>94</td>
</tr>
<tr>
<td>Appendix E: Ethics Certification</td>
<td>97</td>
</tr>
</tbody>
</table>
List of Tables

Table 1. *Participant Names and Background* ................................................................. 31
List of Figures

Figure 1. Experiences in YYJ Tech Ladies ................................................................. 94
Figure 2. Learning and Professional Development ................................................. 95
Figure 3. Professional Development Barriers .......................................................... 96
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Chapter 1: Introduction

The underrepresentation of women in technology and leadership is are relevant and timely issues. Increasing daily use of technology has necessitated greater literacy and skills. Additionally, the growth of the industry, high salaries in some roles, prevalence, and increased the demand for workers places a high value on technical skills and careers. This growing demand for skills and means more career opportunities and suggests that more women may be entering technology careers. However, the numbers of women in technology careers remain low (Mueller, Truong, & Smoke, 2018). In 2016, women were only 23% of technology workers in Canada (Wall, 2019). To increase the representation of women in technology and leadership, researchers have focused on training and creating women-friendly spaces through supportive professional development and mentorship programmes (Faulkner & Lie, 2007; Yost, Handley, Cotten, & Winstead, 2010). While some of these efforts have helped, there are few women directors or executive officers. Women make up 9% of executive officers and directors in Canadian technology companies (Macdougall et al., 2017).

The underrepresentation of women in leadership also impacts women’s experiences in technology workplaces. Previous research points to structural and social/cultural barriers, language, and culture that can reinforce existing stereotypes (Maree & Maree, 2010; Parson, 2016). Researchers have described the competitiveness, unfriendly or individualistic language, being excluded, sexual harassment, and underrepresentation that women can experience in technology spaces as a “chilly climate” (Cech, Blair-Loy, & Rogers, 2018; Parson, 2016; Wynn & Correll, 2018). To address these climates, researchers have focused on supporting women’s ability to fit in and cope with these climates (Lehman, Sax, & Zimmerman, 2017; Morganson, Jones, & Major, 2010; Robnett, 2016; Wang & Degol, 2017).
Improving women's representation in leadership and chances for professional advancement means we must examine the language and practices that reinforce gender norms and create new spaces for women to learn professional and leadership skills (Prescott & Bogg, 2014c; Pugh, 2014). Research must prioritize the experiences of women in technology spaces and understand how they learn in communities. This research seeks to address that. It explores women’s experiences learning in a community for women in careers in technology and investigates how the relationships and community contribute to women’s learning and leadership development.

**What is the Context of This Research?**

This research focuses on the learning and interactions in a community of women in technology careers located in Victoria, BC. YYJ Tech Ladies, formed five years ago as a community for women to make connections and find support by a group of women in the local technology industry. Its purpose is to support the growth and development of women in business and technology in Victoria (“YYJ Tech Ladies,” n.d.) through events and a Slack group. Slack is an online messaging platform for members to communicate openly or privately. In this Slack group, members discuss and share resources for learning, encourage others on work or personal projects, provide support or advice for challenging situations at work, and network for job opportunities. Members can also use this tool to share experiences, seek advice, or build community. Slack and other technology used by community members “are well aligned with the peer-to-peer learning practices typical of communities of practice” (Wenger, 2010, p. 188).

**How is this research personally significant?**

My interest in community-based learning developed from my experiences in Ladies Learning Code and YYJ Tech Ladies. These two communities focus on women’s learning and
building communities of support within male-dominated spaces. Started in 2011, Ladies Learning Code “offer[s] hands-on project-based learning experiences that are designed to give beginners the skills and confidence they need to become digital creators” (“About us,” n.d.). Through Ladies Learning Code, I learned of YYJ Tech Ladies. YYJ Tech Ladies provides support to women in technology in Victoria, BC. Both Ladies Learning Code and YYJ Tech Ladies facilitate learning through workshops, events, and networks.

The relationships, support, and resources in Ladies Learning Code and YYJ Tech Ladies facilitated my identity growth as a learner and a woman in technology. Identity formation in communities of practice occurs through identity negotiation and participation that shapes “practice in the broader social landscape” (Farnsworth, Kleanthous, & Wenger-Trayner, 2016, p. 145). As a woman, I felt like an imposter and that the only way I could learn to use and create technology was by studying in Computer Science or Engineering degree programme. When I joined both Ladies Learning Code and YYJ Tech Ladies, communities of women for learning about technology and working in the local technology industry, I saw from others that there were other ways to create and work with technology.

Participating in Ladies Learning Code and YYJ Tech Ladies also helped develop my identity as a woman in technology. In these communities, identities as women were central. I was able to learn and engage in identity production, characteristics of communities of practice (Wenger, 2010). As a woman, I felt a sense of belonging which I had not experienced before. Learning within these communities provided a safe space to negotiate identities as women in technology, be critical of the social structures and stereotypes, build relationships and new practices, and collectively act towards creating social change. These processes of producing social structure, cultural knowledge, and identity are integral to communities of practice
(Wenger, 2010). These were catalyzing learning experiences for me. Seeing other women in technology roles and careers helped me see greater opportunities for these skills and the importance of greater representation of women.

The support from these relationships and communities were crucial to my learning and increased my interest in exploring informal learning contexts. Participating in YYJ Tech Ladies provided opportunities to learn, build my identity, and engage with others. I experienced supportive environments where women encouraged each other to take risks and learn new skills and discuss their realities as women in male-dominated careers. I saw women role models who changed careers to work as software developers, who were leading technology teams, who were building technology to address social inequalities and others who resisted the traditional stereotypes of a white, male programmer. This experience was in contrast to the learning experiences in most of my high school and formal undergraduate education, which made me feel like a passive learner and had little personal significance. The support and community relationships inspired me to explore a career in educational technology, engage in community building and feminist theory, and research the intersection of community learning, gender, and technology.

**How does my positionality shape this research?**

My experiences and worldview shape my positionality as a researcher and how I approached this research. As an intersectional feminist researcher, I believe that their experiences shape people and meaning is socially constructed. I am also influenced by the privileges that I experience as a cis-, white-female, settler-Canadian from a middle-class background. These privileges shape how I view the world and am viewed by others. I have a background in post-secondary education and have worked in higher education administration and graduated with a
Bachelor of Arts. As a member of YYJ Tech Ladies for the past three years, I have an insider understanding of this community, including a focus on gender representation of women in technology. Having this insider status means that my own experiences and perspectives influence how I see YYJ Tech Ladies. This contributed to my actions through my multiple roles as a researcher and member.

**Intersecting Theoretical Approaches**

Multiple theoretical approaches shaped this research. The belief that truth is subjective and constructed by our positioning and interactions in our world is grounded in social constructionism. Wanting to ensure that my research reflected this perspective, I embodied critical pedagogy and feminist pedagogy approaches in my research design. Both of these pedagogical approaches are deeply rooted in practice and social change. These three approaches – social constructionism, critical pedagogy, and feminist pedagogy – comprise the worldviews and practices used in this study.

**What is social constructionism?**

Social constructionism views learning as an ongoing process of constructing knowledge and that experiences and identity construct our realities in the world (Coghlan & Brydon-Miller, 2014). Learning occurs everywhere and is a cultural, historical and social. Rooted in Vygotsky’s theory on social learning and work that influenced Cultural-Historical Activity Theory (CHAT), social constructionism views learning as holistic and ongoing. Drawing from CHAT’s view that learning occurs through “active engagement in the world” and shapes “what we become and how we act as knowers” (Roth & Lee, 2007, p. 201-215). Learning is a continuous process of engagement with the world that must be understood through the cultural and historical context (Roth, 2017). Social constructionism acknowledges that truth is subjective. Truth is continually
constructed and re-constructed through our social environments and relationships (Maynard, 2018). For researchers, social constructionism focuses on relationships, especially “the researcher’s relationships with the subjects of research, with the audience, and with society more generally” (Gergen & Gergen, 2012, para. 18).

**What is critical pedagogy?**

Critical pedagogy shares the constructivist world view that knowledge is constructed. Popularised by Paulo Freire in his book titled *Pedagogy of the Oppressed*, critical pedagogy interrogates and challenges oppressive values and knowledge (Freire, 2014). Working in the 1960s with rural peasants in Brazil, Freire developed critical pedagogy as a praxis-based approach for conscientização (consciousness-raising). Education, to Freire (2014) was “an instrument for [the oppressed’s] critical discovery that both they and their oppressors are manifestations of dehumanization” (p. 48). Critical pedagogy continues to shape research in its practice of empowering learners, reducing power inequalities, building community, challenging the status quo, and honouring individuality and diversity (Adkins, 2014). Critical pedagogy provides the purpose and tools to affect social and political change in education and research practice.

**What is feminist pedagogy?**

Feminist pedagogy is rooted in feminist and critical theory perspectives for the purpose of identifying power and creating social change (English & Irving, 2015). It is grounded in feminist theory and practice. Feminist theory in western cultures focuses on the social and political structures that disadvantage women. Feminist educators Belenky et al., (1997) and hooks (1994, 2000, 2003) then weave feminist theory and practice together. They prioritize
understanding power dynamics, intersectionality, and women's ways of knowing in creating social change (Belenky et al., 1997; hooks, 2003; Hooks, 1994).

Feminist pedagogy focuses on social analysis and critique, encouraging women’s leadership, organization-building, and catalyzing social change (English & Irving, 2015). It concentrates on women’s learning within a social learning framework by creating “safe and open environments to support women in their learning journey” (English & Irving, 2015, p. 103). Most significantly, this perspective values personal experience, socio-political context, and developing women’s voices (English & Irving, 2012, 2015) by challenging knowledges within a specific context and situation (Patai, 2012), “mak[ing] the lived experiences of women visible” (Kaufman & Lewis, 2012, para. 18). Social interaction is essential. Belenky et al.’s (1997) research on women’s learning introduces this process of understanding subjectivity and the experiences of others as ‘connected knowing’. Connected knowing allows women to connect with others and to their own experiences. Thus, relationships and interactions can help women develop their own identity, understanding of social conditions and power that affect them, and connect with a community for support as they work towards social change (Belenky et al., 1997; English & Irving, 2012, 2015). As a feminist researcher concerned with social change, feminist pedagogy was a way to integrate this value in my research.

**Integrating Theory and Practice**

Exploring the impact of a community of practice on women’s learning in technology was a way to centre my research in my local context, build community, and investigate my own experience. In both critical pedagogy and feminist pedagogy, these actions move towards integrating theory and practice, known as praxis. “Praxis can be defined as reflections and actions directed toward the transformation of oppressive mechanisms and structures” (Clover,
Etmanski, & Reimer, 2017). For this research, I built upon on previous research on gender, learning, and technology (Fernandez & Campero, 2017; Prescott & Bogg, 2010; Shapiro et al., 2015; Vitores & Gil-Juárez, 2016) and social constructionist, critical pedagogy, and feminist pedagogy approaches and practice. My purpose was to incorporate these theories and practices into my research on women’s learning in a community.

Being critical and aware of my role as a researcher was an essential goal in my research practice. Reflexivity, for the researcher, attempts to represent the roles, biases, and positions they bring to the research. This practice of reflexivity "can lead to a heightened awareness of the differences between participant and researcher, to transformation on the part of the researcher or the participant or both, and the construction of common ground between them" (Hesse-Biber & Brooks, 2012, para. 7). In my research practice, reflexivity included regularly evaluating how the research aligned with my feminist pedagogy perspective and values, identifying ethical considerations, recording my impressions of the research process, and reflecting on my multiple roles (as a member of YYJ Tech Ladies and a researcher) in the research. Through these practices, I explored my role as a researcher in practicing critical pedagogy and feminist pedagogy.

**Research questions**

The purpose of this study was to share women’s accounts of their learning and professional development within a local community of women and using a case study and focus group methods within a critical pedagogy and feminist pedagogy approach to inquiry. Using these methodologies and approaches, I asked the following research questions:

- How does participation in a local community of women in technology contribute to women’s learning and leadership development?
  - How does engagement in this community impact women’s awareness of their experiences in technology?
How do women describe their experiences in this community?
How do women describe their learning and leadership development?
How does participation impact their identity and actions as a woman in technology?
Chapter 2: Literature Review

What Are Women’s Experiences in Technology?

I entered my master’s programme with curiosity about women’s experiences in technology education and workplaces. Inspired by my own experience and work with community programmes, Ladies Learning Code and YYJ Tech Ladies, I wanted to investigate why there were few women in technology careers. As I began to research, I noticed that most of this research focused on the discrimination or exclusion that women experienced in education and workplace settings. This is commonly termed the ‘chilly climate’ (Cech et al., 2018; Prescott & Bogg, 2014b; Wynn & Correll, 2018). Women’s underrepresentation in these settings is also described as the ‘leaky pipeline’ that affects women’s opportunities for leadership (Bergeron & Gordon, 2017; Hancock & Hums, 2016; Metcalf, 2010; Wynn & Correll, 2018).

What is a ‘chilly climate’?

Much of the research in women and technology focuses on the gender gap in technology education and the workplace. The gender gap represents the significantly higher numbers of men in Science, Technology, Engineering, and Math (STEM) fields compared to women (Francis, 2015). Women hold less than 25% of positions and 9% of executive officer roles in technology (Macdougall et al., 2017; Naizer, Hawthorne, & Henley, 2014). Previous research suggests that this gender disparity is the result of a ‘chilly climate’ in STEM environments (Parson, 2016; Prescott & Bogg, 2014; Wynn & Correll, 2018). A ‘chilly climate’

conveys a sense that men are more prevalent or more important [or] . . . permeated with references to cultural knowledge, hobbies, or behaviors [sic] that are more commonly associated with men than women … women are referred to in sexualized or other gendered ways (Wynn & Correll, 2018, p. 152).
Women experience this ‘chilly’ climate through language that perpetuates discriminatory views of a passive student, knowledge as static, cis, white, heteronormative male-dominated workplace culture, gendered role segregation (more women in human resources, administration, and marketing), and workplace sexism and discrimination (Parson, 2016; Prescott & Bogg, 2014c).

Research by Prescott and Bogg provides insights into women’s experiences in technology (2014b). Their findings offer valuable understandings into some challenges and benefits that women in western societies may experience in technology careers. They recognize how workplace culture such as a ‘chilly climate’ can affect women’s interest in working in technology industries (Prescott & Bogg, 2014b). In their study of female game developers and their career development, they identified how the women experienced a ‘chilly climate’ (Prescott & Bogg, 2014a). The women reported different experiences from their male co-workers, workplace discrimination and sexism, and earning less than men in the same roles (Prescott & Bogg, 2014c). Experiencing these types of discrimination and masculine workplace culture was common among these women as they described that it “took a certain type of woman” and that ‘thick skins’ and being more masculine were necessary to “work in this male dominated industry” (Prescott & Bogg, 2014b, p. 105).

In their study of technical recruiting sessions at a university, Wynn & Correll (2018) found that women students asked questions 36% of the time in sessions that excluded women in the presentation and discussion, used gender stereotypes and highly technical language, and referenced geek culture, thus enforcing a ‘chilly climate’ (Wynn & Correll, 2018). In sessions with female role models, accessible content and presentations, and focus on the real-world and interdisciplinary effects of coding, women asked questions 65% of the
time (Wynn & Correll, 2018). These differences in women’s engagement suggest that ‘chilly climates’ affect women’s sense of belonging and participation in these chilly environments.

Stereotypes in technology spaces that women are outsiders hinder women’s career and leadership development. In their study of workplace culture and climate in science and engineering academic departments, women’s awareness of ‘chilly climates’ was higher than men, but not underrepresented minorities (Cech et al., 2018). They found that women were “more likely [than men] to report personal experiences of marginalization [sic] at work” and “participants who reported feeling marginalized [sic] were more likely to report chilly climates in their department” (p. 147-48). ‘Chilly climates’ inhibit disadvantaged groups’ career development as they face the burden of convincing others of their disadvantage (Cech et al., 2018). Subtle messaging, including posters, references to male ‘geek’ culture, and other symbols negatively affect women’s interest in working or studying in computer science environments (Cheryan, Ziegler, Montoya, & Jiang, 2017) and contribute to this sense of a ‘chilly climate’ in technology spaces.

**What is the ‘leaky pipeline’ metaphor?**

Many researchers link the ‘chilly’ environment to the declining numbers of women in senior STEM careers to the ‘leaky pipeline’. This metaphor describes the phenomenon of women leaving STEM education programmes and roles at every career stage (Prescott & Bogg, 2014b; Shapiro et al., 2015; Wynn & Correll, 2018). Cracks in this pipeline begin as early as middle school as girls’ confidence in math and science falls, and they take fewer advanced math and science courses in high school (Sanders & Nelson, 2004). Subtle messaging in classroom environments, interest, self-efficacy, and confidence is linked to girls' lower enrollment in higher-level STEM subjects (Bergeron & Gordon, 2017; Naizer et al., 2014). As a result, fewer
women enrol in university STEM programmes. Women account for 20% of STEM programme enrollments (Hango, 2013). Fewer numbers of women choose to enter male-dominated careers such as STEM.

Even if women enter STEM careers, the cracks in the pipeline continue. In their study of retention rates of women in STEM, Glass et al. (2013) reported that women were 807% more likely to leave STEM fields. Even when controlling for family demands, promotions into management, and work conditions, women left STEM careers at a much higher rate compared to other professional fields (Glass et al., 2013). The only significant difference that Glass et al. (2013) found was that “women in STEM fields do not react as positively to increasing job satisfaction, job tenure, and advancing age, suggesting that climate issues or lack of “fit” between worker and job persist for longer periods of time in STEM careers” (p. 744). As they build experience and skills in their careers, the numbers of women who enter leadership roles shrinks. Fernandez & Campero (2017) link this “‘glass ceiling’, the phenomenon in which women disappear through the levels of the organizational [sic] hierarchy” to “external recruitment and hiring processes” (p. 73-74). Fewer women in these leadership roles meant fewer role models for future women leaders (Prescott & Bogg, 2014b).

The ‘leaky pipeline’ metaphor is prominent through much of the research into women in technology. However, as Vitores & Gil-Juárez (2016) and Metcalf (2010) identify, this metaphor has implications for what researchers choose to investigate and ignore. In their meta-analysis of ‘leaky pipeline’ research, Vitores & Gil-Juárez (2016) identify common topics of ‘leaky pipeline’ research, including stereotypes in the computer science field, computer science as being a male-dominated field, lack of awareness and accurate information on computer sciences careers, and computer science as an unattractive subject area. While these topics address some of
the challenges that women may face in technology fields, Vitores & Gil-Juárez (2016) argue that these perspectives reinforce existing beliefs about technology. In particular, the linear nature of the ‘leaky pipeline’ model ignores intersectionality and homogenizes experience (Metcalf, 2010; Vitores & Gil-Juárez, 2016). The ‘leaky pipeline’ metaphor also favours the economic impact, views women and other minorities as passive resources, and hides multiple forms of oppression that specific populations may experience (Metcalf, 2010; Vitores & Gil-Juárez, 2016). It also presents a ‘deficit model’, where “girls and women are portrayed as ‘failing’ to enter and navigate the ‘pipeline’ or as being deficient or deviant from a ‘normal’ relationship with computing in terms of their attitudes, skills, practices, interests and aspirations” (Vitores & Gil-Juárez, 2016, p. 671).

**What barriers do women face?**

Research into the underrepresentation of women in STEM fields highlights common barriers to women’s leadership development in all industries. These barriers include few opportunities for work-related learning, professional development or leadership development, and support systems and career resources. In their research into professional development for women in STEM, Maree & Maree (2010) and Parson (2016) echo these findings. Structural and social/cultural barriers, including a lack of female role models, traditional gender stereotypes (Maree & Maree, 2010), and traditionally masculine values in educational institutions and workplaces that are individualistic, competitive, and reliant on fixed concepts inhibit women’s learning and career development (Parson, 2016).

Additionally, gender bias in organizational culture (Ely, Ibarra, & Kolb, 2011), gaps in access to support systems and career resources (Prescott & Bogg, 2013), and support for workplace learning can hinder women’s professional development opportunities. Boeren’s
(2011) research into non-formal learning in the workplace suggests the lower numbers of women employed in “demanding jobs asking for continuous upgrade of knowledge and skills” results in fewer career development opportunities for women (p. 344). These barriers limit their learning opportunities for professional development and career advancement.

Researchers also identify structural barriers, including a lack of workplace support and time restrictions that affect women’s professional development and leadership. Chuang (2015) categorizes the main barriers women face as family and time restrictions, cost and work limitations, an absence of support systems, and insufficient career resources and advice. Gaps in access to support systems and career resources, including opportunities to learn through mentoring and networking, prevents women from advancing their careers (Prescott & Bogg, 2014c). These structural factors, shaped by social and cultural influences, limit the mobility of women in their careers and their opportunities to participate in non-formal learning in the workplace.

**How Can We Support Women?**

**View women’s experiences in technology holistically**

Vitorees & Gil-Juárez (2016) suggest that intersectional and multi-faceted perspectives to research into women and technology can be achieved by shifting how we approach this research. They provide alternatives to ‘leaky pipeline’ research that focuses on making women’s history in computing visible and representing non-western realities, especially research from India, Malaysia, Afghanistan, Armenia, and Mauritius where there are much higher rates of women in technology fields that in western countries (Vitorees & Gil-Juárez, 2016). The high status of technology careers, higher levels of parental support, and STEM fields are seen as a neutral domain are factors contributing to a significant increase of women in computer science education.
in India (Varma, 2010a, 2010b, 2011; Gupta, 2012; as cited in Vitores & Gil-Juárez, 2016). In Malaysia, government quotas, fewer gender stereotypes of technology fields, and the stigma of outdoor work contribute to higher levels of women in computer science and information technology fields (Vitores & Gil-Juárez, 2016). Vitores & Gil-Juárez (2016) recommend expanding the research into other computing sites and contributions, including non-technical roles in technology. They suggest highlighting women who enjoy computing and the reasons they choose to enter the technology field and the reasons they stay (Vitores & Gil-Juárez, 2016). Rather than viewing the low rates of women in technology fields in western societies from a deficiency perspective, these approaches provide a nuanced, holistic, and contextual understanding of women’s experiences in technology fields and careers.

**Prioritize role models and mentors**

Role models and mentors are significant to women’s leadership development. Townsend & Sloan (2015) identify the importance of increasing women's learning opportunities through intentional role modelling, mentoring, community building, and providing "accurate career information" (p. 197). Mentoring relationships can provide role models, learning opportunities, and support for women as they navigate their workplaces and career paths. Mentoring is linked to higher self-efficacy of women in STEM careers (Yost et al., 2010). Dyer (2004) suggests that early mentoring interventions can increase women’s likelihood of participating in a STEM career (as cited in Yost et al., 2010, p. 101). Prescott & Bogg’s (2014b) research into mentoring, suggests that formal mentoring relationships are particularly beneficial to women working in male-dominated careers and that women often identified “a lack of mentoring opportunities as a barrier to their progression” (p. 180).
Prescott & Bogg (2014a) point to the support and confidence-building that mentees can experience through mentorship as a critical solution to improving women's education, participation, and advancement in STEM fields. Maree & Maree (2010) suggest mentorship for women and girls that builds confidence and personal awareness may be a solution to addressing the gender gap in STEM education and careers. Confidence building and personal development are the focus of much of mentorship research. Herring & Marken (2008) report that confidence and personal agency are essential factors in women's success in post-secondary computing education. Relationships with mentors can improve women’s career progression. According to Hayden (2006), mentorship allows mentees to reflect and build upon their strengths and weaknesses and understand workplace cultures. Finding support or a role model through a mentor may provide other women with the tools and confidence to pursue leadership positions in male-dominated fields.

Gender of mentors and mentees can also affect women’s learning and leadership development. Formal mentorship programs are seen to positively contribute to women’s career and leadership development by building women’s leadership identities, creating informal networks of support, and providing safe spaces through women-only programs (Ely et al., 2011). Women-only mentorship programs “can provoke powerful insights” through “foster[ing] learning by putting women in a majority position”, within a work environment that is shaped by its male majority (Ely et al., 2011, p. 488). Alternatively, male mentors may help women’s professional and leadership development more in some contexts. In Hancock & Hums’ (2016) study into women’s career development in NCAA Division administration, “male mentors seemed to play a more critical role in the career guidance of most participants” (p. 205). They suggest that the greater availability of male mentors and the perception that male mentors better
understood intercollegiate athletic careers may be reasons that the women chose male mentors more often. However, some of the women felt more comfortable seeking personal advice from a female mentor (Hancock & Hums, 2016). Gender is a factor in mentorships, especially in male-dominated industries. A male mentor may provide more access to leadership and career progression, while female mentors may be able to provide support through similar experiences as underrepresented minorities in the workplace.

In the workplace, research has focused on mentorship programs for women as a way to establish structural and social supports for women’s career development. Role models and mentors are suggested to provide support and networks (Yost et al., 2010), build confidence and self-awareness (Prescott & Bogg, 2014a), and career guidance (Hancock & Hums, 2016). This research explores how YYJ Tech Ladies can meet this need for role models and mentors for women in technology. It explores how a community can provide informal learning

**Focus on informal and non-formal learning**

Informal learning (socialization and social influences) is particularly crucial for women and their motivation to choose a STEM career or education (Endephols-Ulpe, Sander, Geber, & Quaiser-Phol, 2015). Informal learning is

the lifelong process by which every individual acquires and accumulates knowledge, skills, attitudes and insights from daily experiences and exposure to the environment—at home, at work and at play: from the example and attitude of families and friends; from travel, reading newspapers and books; or by listening to the radio or viewing films or television (Bancheva & Ivanova, 2015, p. 158).

While informal learning can be characterised as “conscious, deliberate, as well as subconscious and random learning efforts outside academic settings”, it can also include socialization and
stereotypes in society (Bancheva & Ivanova, 2015, p. 160). Informal learning can also be part of “organizational [sic], professional or occupational contexts and [serve] to cope with tasks, requirements or [facilitate] in problem solving” (Bancheva & Ivanova, 2015, p. 160).

The line between informal and non-formal learning becomes blurred in the examples of professional development, such as mentorship programmes and communities of women (Yost et al., 2010) and social networks (Chuang, 2015). Non-formal learning is methodic and goal-oriented “learning or studying, occurring in an institutional context. . . which does not result in formally recognized [sic] grades, degrees or certificates” (Bancheva & Ivanova, 2015, p. 159). Both informal and non-formal learning could include professional development or mentorship programmes. However, in the context of this research, I will use informal learning to understand the experiences and interactions in this community of women in technology.

**Develop communities of practice**

Communities of practice is a concept developed by Lave & Wenger (1991). It describes learning that “takes place through our participation in multiple social practices” which are socially constructed within “a cultural and historical context” (Farnsworth, Kleanthous, & Wenger-Trayner, 2016, p. 140). Communities of practice are “self-organising groups of practitioners who have the required knowledge, use it, and need it” (Snyder & Wenger, 2010, p. 109). A community’s effectiveness is dependent on three dimensions: identity and purpose of the community (domain); the community and qualities of relationships among members (community); and activities and methods for sharing and developing knowledge (practice) (Snyder & Wenger, 2010). Communities of practice can include informal community groups, workplace groups, and professional organizations. A community of practice can form around a shared interest in a topic (domain) and members' application of that knowledge (practice).
(Snyder & Wenger, 2010). However, learning is not limited to individual members of the community. The community itself transforms through the knowledge sharing and acquisition within the community and from its members. The community becomes the tool for learning, a source of knowledge and meaning (identity) and the context in which members can participate (Curnow, 2013).

Practice, one of the critical components of the communities of practice concept, describes the action of knowledge and identity development within a community. Practice occurs “through their increasing participation (with others) in the relevant and inevitably structured social practices (activities, tasks, habits) of the community” (Fuller, 2007, p. 19). Community members and the community collectively engage in the “process of realignment between socially defined competence and personal experience” (Wenger, 2010, p. 181). Learning is "an experience of identity. . . [and a] process of becoming” that “transforms who we are and what we can do”. Hara (2009) expands this concept to include how interactions among community members shape identity formation and “learn from each other” (p. 118). This practice has been shaped by technology as new online communities form.

Since the introduction of the concept in the early 1990s, the increasing prevalence of technology has created new opportunities to study the intersection of technology and communities of practice. Hara’s (2009) research explores peer networks’ use of technology and informal learning. Online communities of practice differ from face-to-face communities of practice, particularly with the asynchronous nature of online communities (Hara, 2009).

Knowledge sharing, in online communities of practice, must also include

(1) self-selection, (2) validation of one’s practice with others who share a similar working situation, (3) the need to gain a better understanding of current knowledge and best
practices in the field, (4) a non-competitive environment, (5) the asynchronous nature of the online communication medium, and (6) the role of the listserv moderator (Hara, 2009, p. 105).

This understanding of online networks and communities and the differences in interactions is essential in exploring the role of technology in communities of practice.

While communities of practice define the context, organization, and practice of peer-to-peer learning, they do not address the relationships of power within the community or with other communities of practice and social groups (Hughes, Jewson, & Unwin, 2007). Curnow’s (2013) study of gender in a community of practice investigates the process of consciousness-raising of gender inequality in a community of practice with mostly male leaders. Curnow (2013) finds that communities of practice “are not unified – inequality, oppression, and privilege are enacted within them and affect situated learning” (p. 834) Curnow (2013) observes a sub-community of women form as they experienced marginalization by male leaders in this community. It is clear that while communities of practice can bring individuals together over a shared identity and practice, they can also perpetuate stereotypes and oppression. This research will use this concept to explore the learning of the members of YYJ Tech Ladies.
Chapter 3: Methodology

Aligning my methodology with my theoretical perspective was one of my key goals as I determined my research design. I wanted to ensure that my social constructivist, critical pedagogy, and feminist pedagogy approaches were practiced in the research design. In particular, I wanted to represent the construction of meaning through interactions and relationships within YYJ Tech Ladies. I selected a case study methodology and focus groups and journal entry methods that would support this. Focus groups would provide insight into the interactions and meaning within YYJ Tech Ladies. Journal entries would capture additional insights and provide opportunities to reflect, a key component in feminist pedagogy. In this chapter, I will explore this process as it related to this methodological choice. I will define a case study, its suitability for this research, and how it was applied.

Why a Case Study?

What is a case study?

A case study is one of the most common methodologies used in both qualitative and quantitative research. Case studies are “exploratory form[s] of inquiry, providing an in-depth picture of the unit of study, which can be a person, group, organization or social situation” (Stewart, 2017, para. 3). Data collection methods used in case studies include focus groups, participant observation, interviews, document analysis, and surveys (Yin, 2009). This flexibility has contributed to critiques of validity in case studies. However, instead of applying quantitative rigour to qualitative case studies, researchers have suggested using several methods, focusing on this methodology’s alignment with the research question, and linking with previous literature (Verschuren, 2003). As such, case studies’ versatility means they complement many methods and theoretical perspectives (Stewart, 2017) and answer the ‘how’ and ‘why’ in research
questions (Stewart, 2017; Timmons & Cairns, 2012). These characteristics made a case study an appropriate option for this research.

**Why is a case study suitable for this research?**

A case study suited the values and purpose of this study. I wanted to ensure alignment between the theories that informed me and my research practice. Selecting a case study methodology for this research allowed me to align my theoretical approaches and practice critical pedagogy and feminist pedagogy values. It allowed me to define the unit of study—YYJ Tech Ladies clearly—and focus on the meaning and interactions that are practiced in feminist pedagogy and critical pedagogy. Case studies can also “‘close in’ on real-life situations and test views directly in relation to phenomena as they unfold in practice” (Flyvbjerg, 2006, 235). Case studies’ flexibility of methods meant I could uncover in-depth experiences through focus groups and journal entries. In this context, this methodology provided a critical link between the theory and practice, values central to critical and feminist pedagogy.

**How does this research draw on a case study methodology?**

This research draws on case studies’ exploratory and adaptability to support the goals and practice. A case study provided a process for weaving critical and feminist pedagogy and researcher reflexivity. Thus, being able to develop “a nuanced view of reality” (Flyvbjerg, 2006, p. 223). In this research, I used this process to explore the context and meaning-making within YYJ Tech Ladies for more in-depth insights into what it is like to learn in a community. I also used this methodology as a framework for designing the data collection process. I wanted to observe the identity and knowledge construction in the community, integrate feminist reflective practice, and create space for women to share their voices and reflect. The focus group and journal entries supported this. They provided an in-depth account of the interactions and
reflection as part of the learning process in YYJ Tech Ladies. These methods will be discussed in the next section.

**Methods for Practicing Critical Pedagogy and Feminist Pedagogy**

Capturing women’s experiences in technology, exploring how women learn and practice professional development in a community, and identifying how communities of practice and informal networks can contribute to change in technology spaces was the purpose of this research. To facilitate this, I chose focus group and journal entry methods. Focus groups created a space for shared meaning-making and sharing experiences and the journal entry allowed each participant to reflect. I sought to involve the participants in the research and encourage self-reflection through multiple research methods, focus groups and journal entries. Open-ended questions were used to create more space for participants’ own words and interpretations. These questions focused on personal experience in technology spaces and with professional development, participants self-awareness of their learning, interactions, identity concerning YYJ Tech Ladies, and reflecting on what they learned in the focus group. The focus groups were intended to capture women's experiences and insights on how informal interactions in a community context contributed to participants’ awareness of their professional development. Together these methods contributed to an understanding of the women’s experiences and learning in the community.

**Focus groups**

Focus groups were one of the sources of data in this research. Originating in market research, focus groups are valuable methods in social sciences research, which seek to understand the specific meaning and interpretations within a group (Liamputtong, 2015a). Focus groups collect data in a group interview setting where the researcher takes on multiple roles as
the facilitator, observer, interviewer, and participant and can vary in structure (Liamputtong, 2015b). Focus groups are a useful method for engaging participants and encouraging self-reflection and can effectively capture the social interaction within the group, and a deeper understanding of the experiences as participants can build upon each other's responses (Stewart, Shamdasani, & Rook, 2011). Using this method allowed me to capture how participants valued learning and the YYJ Tech Ladies community and make sense of their identity of a self-identified woman in technology. This method's ability to represent meaning and reality construction was a choice that supported the purpose of this research.

Focus groups provided space for participants to share their experiences and reflect with other members of the YYJ Tech Ladies community, experience multiple perspectives, and co-create new interpretations of professional development and community. A method commonly employed by feminists (Leavy, 2011), focus groups can create space for multiple voices and reduce power imbalance between the researcher and the participants (Liamputtong, 2015a). Feminists also use focus groups to understand women and other minorities’ experiences and provide opportunities for reflection. Leavy (2011) suggests that focus groups can access “subjugated voices” or capture “the experience of oppression” by creating space for interactions among members (p. 172-81). Interactions among women in a focus group can give space for women to reflect and participate in consciousness-raising (Liamputtong, 2015a). Focus groups’ ability to investigate meaning and create space for reflection is valuable in social justice research.

For this study, two focus groups were conducted. Four women participated in the first and three in the second. By conducting smaller focus groups, I aimed to create space for discussion and reflection. According to Liamputtong (2015b), ‘mini-focus groups' are becoming
more popular and can be an effective way to encourage active discussion in some situations. I wanted to encourage active discussion and create space for “all participants to speak and to explore the discussed issues in greater detail and this often leads to more relevant and interesting data” (Liamputtong, 2015b, para. 42).

The focus group questions were designed to explore these three areas of meaning. In particular, they supported: (1) experiences in technology; (2) experiences in YYJ Tech Ladies; and (3) their identity and actions related to learning and leadership development. Participants received the questions beforehand and were invited to share stories and engage in open-ended discussion using these questions as a guide. See the focus group questions in Appendix C. In both of the focus groups participants were encouraged to ask questions and discuss related topics as a group. As a result, each focus group explored these main areas of professional development, women in technology, and YYJ Tech Ladies community in different ways.

The first focus group was conducted in December 2018 at the University of Victoria for one-and-a-half hours. The four participants sat in a semi-circle around tables in a seminar room. I provided paper copies of the questions for participants and sent them beforehand. I described the focus of my research and how I planned to facilitate the process. I explained that the questions were a guide—they were welcome to share what was meaningful to them and explore other topics. Acknowledging that I had multiple roles as a researcher and member of YYJ Tech Ladies, I focused on setting expectations for an open and safe space. I reiterated the ethics outlined in the consent form and explained that if they were ever uncomfortable, they had the right to withdraw or ask that their information be removed or amended. Participants engaged openly and respectfully, however I questioned my role as the facilitator when I noticed that two participants spoke more than others. Not wanting to interrupt the thread of the discussions, I decided to ask
questions for clarification or to explore a thought deeper only a few times. After the focus group, participants expressed that they appreciated the experience and supportive environment that was created.

The second focus group occurred in January 2019 at the Victoria Public Library for one hour. Three participants sat around a table in a community room. Much like the first focus group, participants received the questions beforehand and had paper copies. I also provided an explanation of my research, expectations, and ethics. The dynamics between the two focus groups varied significantly. In the second one, all three participants spoke equally and answered each question systematically. As the facilitator, I found that my role was different. I was more involved in asking clarifying or follow-up questions and sharing some of my own insights. In facilitating these two focus groups, I learned how different participants, contexts, and environments could change the dynamics of a focus group.

I used video and audio recordings to collect the data from both focus groups. I borrowed a camera from the University of Victoria Library and the Voice Memo application on my smartphone. Since the video camera was placed at the back of each room to capture all participants, I placed my phone in the centre of the participants to capture audio. I realized how beneficial this backup audio recording was when I began transcribing the recordings. Some of the video camera audio was inaudible, so I used the audio recording to identify this information. I manually transcribed the recordings into text documents. I also recorded notes and impressions during the focus groups for analysis.

**Journal entries**

The second method used in this research were journal entries. Part of the narrative inquiry family of methods, journal entries can help to develop trustful and respectful
relationships with participants (Lewis, 2014). Narrative inquiries provide space for participants to express their ideas and a way for researchers to preserve the data in the participants’ own words (Lewis, 2014). This method fit well with the feminist and critically-reflective approach and purpose of my research by involving participants in the research process and creating space for challenging mainstream culture, history, and society (Chase, 2017). The journal entry prompts encouraged participants to think of an experience learning in YYJ Tech Ladies and their views of learning and professional development. These entries were written before and after the focus group to capture how participation in the focus group influenced their perspectives on professional development and to create space for participants to reflect upon their own learning experiences.

For both journal entries, participants were invited to elaborate on how they described learning and their experiences in the technology industry. The entries were scheduled before and after the focus group to encourage reflection and deeper insights from the focus group. For the first entry, participants were prompted to describe a time when they learned in YYJ Tech Ladies. This prompt intended to begin reflection and thinking about learning for the focus group. The second entry encouraged participants to discuss their views of learning and professional development and how the focus group interactions might have shifted their view. See Appendix C for the full journal entry prompts. Together these prompts were designed to encourage reflection on the process of learning and professional development.

**Reflecting as a Researcher**

Integrating critical reflection and stating my positionality as a researcher was an essential part of enacting feminist pedagogy research practice. As a member of YYJ Tech Ladies and a woman in technology, it was necessary to represent how my own beliefs shaped the research
questions, interactions with participants, and understanding of participants' experiences. To reflect on my role as a researcher, I documented the research design and ethics processes, wrote memo notes during the focus groups and data analysis. Memo notes are a useful tool for reflexive research practice in feminist research as they can help to visualize the researcher's role and connections among the data (Leavy & Harris, 2019). Incorporating reflective practice throughout the research process was also crucial in learning about the research process and identifying considerations for future research.

Data

**How were participants recruited?**

Participants were recruited from the YYJ Tech Ladies for this case study of professional development and learning for women in technology. I selected YYJ Tech Ladies due to my personal interest and membership. For this research, all participants were members of the YYJ Tech Ladies. To become a member of YYJ Tech Ladies, individuals can join the Slack workspace through an invitation link from another member or through the YYJ Tech Ladies website or attend a YYJ Tech Ladies event.

To recruit participants for this study, I used two main recruitment methods. The first method I used was an open invitation to participate in the #general and #career channels. Within the YYJ Tech Ladies workspace, there are approximately 44 channels any member can join to discuss a topic of interest. All members are automatically subscribed to the #general channel upon joining the workspace. After two rounds of invitations, I received two expressions of interest. At a YYJ Tech Ladies event in November, I advertised my call for participants. Advertising at in-person events was part of my original recruitment plan, and it was successful. After the event, eight participants expressed interest and consented to participate. A total of
seven participants participated in focus groups and journal entries (one participant withdrew before the first journal entry). Each participated in one of two focus groups. All but one contributed two journal entries. At the point of analysis, there were fourteen sources of data: two focus group videos and transcripts, seven first journal entries, six second journal entries, and my researcher notes.

**How did I analyze the data?**

Data was collected from the two focus groups, two journal entries, and researcher notes. This data included transcriptions from the focus groups, journal entries, and researcher notes and was input into NVivo. To analyze this data, I used thematic analysis. Thematic analysis, categorized as "an analytic approach and synthesising strategy", is used in many research methods to understand the meaning in the data (Lapadat, 2012, par. 2). Using this approach, I reviewed the transcripts, and on the second reading, created codes using exact language that participants used, including their descriptions of the emotions, context, and power conflicts participants they experienced. I then grouped the themes into broader categories and mapped each category using NVivo data analysis software. This analysis process yielded three main categories that I mind-mapped in NVivo: (1) experiences in the technology field (Figure 1), (2) learning in the YYJ Tech Ladies community (Figure 2), and (3) challenges to learning and leadership development (Figure 3).
Chapter 4: Findings

Participants were members of the YYJ Tech Ladies community and identified as women in technology or business careers. Four participants worked in technical roles, and the remaining three participants worked in human or project-facing roles that interacted with technology daily. Two of the participants were newer to the YYJ Tech Ladies community, while the rest of the participants had been members of the community for various lengths of time since YYJ Tech Ladies’ formation five years ago. Each participant is introduced in Table 1.

Table 1. Participant Names and Background

<table>
<thead>
<tr>
<th>Name</th>
<th>Background</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ariane</td>
<td>works in community engagement in e-commerce.</td>
</tr>
<tr>
<td>Beth</td>
<td>works as a Business Analyst in the public sector and has over 20 years of work experience in information technology.</td>
</tr>
<tr>
<td>Kristyn</td>
<td>works as a senior software developer at an organization that specialises in public contracts. She studied Computer Science at university.</td>
</tr>
<tr>
<td>Lydia</td>
<td>works as a Product Manager at a local technology company. She studied Computer Science at university.</td>
</tr>
<tr>
<td>Megan</td>
<td>works as a software developer in a local technology company. She studied liberal arts and completed a local software development training programme.</td>
</tr>
<tr>
<td>Sam</td>
<td>works as a software developer at an organization that specialises in public contracts. She studied Computer Science at university.</td>
</tr>
<tr>
<td>Sarah</td>
<td>is a business student who won an award for creating Virtueberry salt scrubs, which is now available online. She is currently finishing her Bachelor's in Business at Camosun, majoring in Human Resources Leadership &amp; Management.</td>
</tr>
</tbody>
</table>

As they shared their stories and experiences, the women expressed what it was like to be a woman in the technology field and noticing the underrepresentation and cis, white, heteronormative male-dominated cultures of technology spaces. They found a sense of community as a member of YYJ Tech Ladies and felt supported. This support and the
interactions they experienced in the community increased their confidence, self-worth, and awareness of their learning. The women described how they learned professionally through seeking resources, mentors, and sharing knowledge with others. In their reflections of professional development and learning, they identified challenges they faced in their workplaces and YYJ Tech Ladies, including a lack of support and reliable resources, motivation, and confidence.

**Experiences in Technology**

Interactions with technology and in technology spaces were experiences that some of the women shared in the focus groups. Working in technology fields and interacting in a community facilitated by technology through Slack provided the women with many opportunities to interact with technology and consider how technology impacted their lives. In particular, they shared stories of feeling underrepresented in technology fields and being aware of issues that women face in technology and stereotypes. However, their experiences as women also created an awareness of the underrepresentation of other identities in technology spaces.

**Seeing women’s underrepresentation and being the “only woman”**

The women noticed and felt the underrepresentation of women in the technology industry, both locally and globally. Lydia, a lead of a technical department, describes being "the only woman in my department" and "almost the only woman" in her Computer Science courses. Megan also describes being aware of some of the issues and stereotypes women face in technology careers as she decided to become a software developer.

You read about what's going on in the States with Uber and stuff when there's all of this – when you're a woman in technology it's already difficult to get into because it's a man's thing to be doing and so you get undermined in that way, and you're not taken seriously
sometimes. That’s all I read about when I was reading about what it was like to be a woman in technology.

Despite the portrayal of women in technology and knowing that she may face similar experiences, Megan decided to “do it anyway”. During her Computer Science programme, Lydia persisted as one of the few women in her courses by reaching out to her classmates; she commented, “Lucky for me, I’m not super introverted, so I used that to my advantage, like ‘Hey, I know you. Teach me something’”.

Awareness of workplace culture, power, and dominant styles of communication was apparent as women shared their experiences working and interacting in technology spaces. Ariane identified a “male-dominated environment” in the technology industry. Kristyn also felt the male-dominated culture in her workplace.

And even within our team, we have quite a good percentage – our project manager is female and even on the business side, their manager is female. We have actually quite a lot of representation, but even still sometimes you feel that.

The women shared that they felt like some voices were heard more than others on their teams. Kristyn shared that on her team, some developers "have more of a voice. . . We have a few where they'll just talk over you, like ‘Maybe I don't agree', but you can't get your voice heard". Beth describes how she creates space for more voices in her role as a Business Analyst and as someone with over 20 years of experience in the technology sector.

What I have been fighting against, and I think it’s helping, is trying to talk to people outside of meetings who can allow the introverted or the intellectual thinker to have a moment to respond to questions instead of being cut off and not being allowed to finish their thought verbally for the room to pick up on. . . I will often say ‘Is there anything
else anybody wants to say?’, and . . . ‘Well, I want to hear what so-and-so thinks. I felt like they were onto something and I feel like there's something important we need to hear there’. If I can't get it in the meeting, I will actually go directly to that person and talk to them, but I think that allows people like yourself [Kristyn] to say, ‘It’s ok for me to speak up in these meetings’.

**Awareness of privilege and responsibility to support others**

Through the women's experiences in technology spaces, they described experiencing a male-dominated culture and an awareness of their privilege and responsibility to support other underrepresented and marginalized identities. Beth expressed how she felt it was essential to challenge power structures and identify who is not represented in the workplace.

I think we need to challenge ourselves to see beyond even just male-female stereotype imbalance and challenge ourselves to all gender imbalances, physical imbalances. . . experiences and voice imbalances, our audience or our peer group could be autistic on many levels of the spectrum (even those in this room might not realize that we are), people who have anxiety issues. . . I think we need to challenge ourselves to just magnify that and say ‘Oh, I’ve just noticed who’s missing’ because we often don't notice who's missing. And by carrying that to work, we can actually start to see people that we didn't realize that we were making invisible in our own minds.

The women were also aware of how workplace cultures can privilege specific individuals and groups. They demonstrated an awareness of the discrimination that women and other marginalized peoples and interest in changing oppressive stereotypes in western culture. Beth brought up the importance of educating and including those with privilege in the change.
Some people at an executive level just aren’t equipped to deal with [power dynamics], and when they know better, they do better. And so, we have to give [leaders] every tool we can and every voice we can for them to do their absolute best at that time.

Including those with privilege came up during the first focus group’s discussion of privilege and women’s experiences in the workplace. Some of the women referenced the “#metoo” movement, an online social movement for ending sexual violence for women and girls, especially women of colour (“About,” n.d.). They saw this movement as bringing the issue of workplace harassment to light, but recognized that much of the coverage focused on cis-white women. To address this, they discussed the importance of educating co-workers and those in decision-making roles on power dynamics in the workplace.

Most of the women in the focus group identified experiences where they noticed the underrepresentation of women in technology. They observed media stories where women in technology experienced harassment and discrimination and workplace environments where some, generally male, voices and behaviours were more valued. Being in male-dominated environments to the women meant sometimes they felt undermined, not taken seriously by other co-workers or not heard. As they shared about their learning in YYJ Tech Ladies, being part of this community helped to cope with these experiences in technology and understand the factors contributing to these experiences.

**Learning in a Community**

**Definitions of learning and professional development**

The women defined their learning and professional development in a variety of ways. For some of the women described learning as acquiring new skills for their current roles or future goals. To Sam, professional development can include
any learning that either helps you feel more comfortable with the job that you’re already doing or helps you work towards a future goal. It doesn’t always have to be super formal. It can be as simple as learning how to teach people, just getting experience outside of work and bringing it back into your work environment.

Megan shared a similar view but stressed how she considered professional development to be an endeavour on her own time.

I kind of split it up into two things, which is things which is: learning a topic or a skill that will help me with something I am doing at work right now, but that I have to learn outside of work, and learning skills aren't actually used in my work but could be in the future.

Learning was also a way to add to their skill development in their current roles. To Lydia, professional development was “something that’s not a part of your everyday duties that I find reinvigorate my want to work. So, if I’m learning something new and I see how it can apply to my job it enriches my work life”.

**Connection to community**

Feeling connected to a community and other women in technology was a theme that all of the participants discussed, as women in technology, having a community centred around this identity was important. For Lydia, "knowing that there are more women in tech out there” made her feel connected. As “the only woman in my department – a tech department,” she appreciated having a broader community of women in technology. Feeling part of a broader community of professionals was valuable to Sam.

When you’re at work you’ve got maybe a few co-workers, a few ladies at work that you can connect with, but sometimes you don’t always connect with them and you’re like ‘Oh
no, I really want someone at work to have solidarity with all these boys in the room’. . .

It’s nice to have people to connect with more in your field.

Being part of a community and connecting with other women in technology contributed to the women’s sense of community and membership in YYJ Tech Ladies. The support and safety of the YYJ Tech Ladies community helped Sam reflect on her career progress and realize how far she had come.

I learned from Mel and the others at the event that many of the mistakes I had made in the first two years on the job were all fairly common. Others had made the mistake of asking too many questions or asking too little. Mel made so many good points that helped me forgive myself for past mistakes or made me realize what I had already learned on the job.

In describing their experiences in YYJ Tech Ladies, the women identified that being part of a community of women in technology helped them feel supported and confident to learn new skills, take on more responsibility, and become a mentor. They also described their learning and some of the challenges that they face, including a lack of workplace support and resources and self-confidence. When asked about how they participated in the YYJ Tech Ladies community, the women described interacting and engaging in the YYJ Tech Ladies Slack workspace and at live events. Kristyn explains how she feels part of the community by using Slack.

The Slack channel is great to just hear what other people think. There’s a bunch of different channels and stuff for different things. Sometimes it not about professional development, it’s just like ‘Where do you guys do your groceries? What are you crafting right now?’
The YYJ Tech Ladies Slack workspace has over 43 public channels that any member can create, join, and contribute to ranging in topics from #career to #feminism to #bookclub. The majority of the interactions that the women describe are through one of these channels or private messages. Beth, however, expresses how "natural" her interactions with other members felt at a recent YYJ Tech Ladies event.

I talked to three different people that there were some very interesting things that they did, and I took a few business cards. Where normally I wouldn't formally pursue that because I don't feel very natural about it. I know other people have a gift for that kind of thing, and they feel seamless about it, and I do not.

Relationships was an essential theme of the second focus group as the women shared how they participated in YYJ Tech Ladies. Lydia shared an example of how she made connections with other community members.

And through YYJ Tech Ladies I've helped make connections with people. A friend of mine just started a new job, so she's basically People Ops for a huge development company. I'm like ‘Oh, here are some People Ops – just helping.’ I love making connections; it's like matchmaking but professionally.

For Lydia, matchmaking and connecting others is how she builds relationships in the community. Megan described a time where she was able to provide a space to host an event and make a new connection.

Somebody was . . . hosting a UX meetup and was like ‘I need somewhere to host.’ I was like ‘Oh actually I can be useful for once!’ So, I also connected her with our People Ops person to see if we could bring that group in to do it at the office because it's a topic that I really want to learn about, so it’s win-win for both of us. And it’s really helpful for
making connections that way too. To be like ‘You need an office? I have an office. Let’s
also be friends because you know things that I want to know. Also, hello!’.
Maintaining relationships with peers and friends is another reason that Megan engaged in the
YYJ Tech Ladies Slack workspace.

I did the Lighthouse Labs boot camp, and there were a bunch of women in that, and the
Tech Ladies Slack is how we all keep in touch now because we're all at different
companies and doing different things, so it's the only way that we can . . . natter at each
other at work.

The prevalence of Slack as a tool in many technology workplaces makes Slack more accessible
and usable at work, something that Megan alluded to in her earlier comment. Multiple
workspaces can be added to the desktop or mobile application, making it easy to switch between
workspaces and communicate with co-workers, peers, and YYJ Tech Ladies members as needed.
For some of the women, the online community’s accessibility at any time helped to maintain
connections and feel supported.

A “safe space” to learn

Most of the women described the YYJ Tech Ladies, supporting them in their professional
development and learning. In particular, Lydia shared how YYJ Tech Ladies was a “safe space”
where she could feel safe to learn and grow. For Sam, Megan, Kristyn, Lydia, and Beth, the YYJ
Tech Ladies Slack workspace was a place where they could ask questions. Megan felt safe to ask
questions to the community.

I don’t feel if I had to go in and ask a question that some people would be like, ‘You
should know that. That’s a dumb question’. I still feel safe enough to ask it there, where
if you do it on Stack Overflow everyone is really crusty and mean. I left the regular YYJ
Tech one because everyone seemed kind of hostile. It wasn’t the same vibe. So, I feel way more comfortable being ‘Ladies, please assist me’ than putting something in YYJ Tech and being ‘Please don’t eat me alive’.

Beth expressed “a sense of security” in YYJ Tech Ladies from a consistent and seamless environment.

I feel safe there. I feel like I’m going to learn there. I feel like if I have that anxiety if I’m not getting it and everyone is past me, there’s always someone monitoring and jumping in and not making me feel like I don’t belong.

Though some of the women described their engagement as low in the Slack workspace, seeing women engaged in the community helped them feel connected to the community. For Megan, this provided a level of comfort and experts whom she trusted.

I think mostly just having that community and knowing that again I can see who knows what about what just by lurking in the #general channel and watching women talk about things and then when I see them at events, I’m like ‘I know about you. You don't know about me. But I know who you are, and you know a lot of stuff, so I'm going to listen to what you have to say,' which is really helpful.

Megan’s account also highlights how she finds ‘lurking’, reading the discussions but not often commenting or engaging in the channels, valuable in developing her sense of community and learning from other members. Lydia shares how she similarly likes to watch the discussions and see other women engaged.

I like watching all of the threads on the Slack board. My new favourite is the #nerdyforcrafting channel. It's just fun to see all these women engaged. It's nice to know you're out there. I'm just more of a lurker still.
Identifying as a ‘lurker’ can have different meanings in other communities. However, with nearly 700 members in YYJ Tech Ladies Slack community, I have observed a variety of levels of interactions. Quite a few members regularly engage in specific channels, and others engage less frequently, including me. From personal experience and observations, other YYJ Tech Ladies have expressed feeling safe and part of this online community.

**Safety in online environments.** Using technology safely and feeling safe in online environments were significant for most of the participants in the first focus group. In discussing access to technology and services, like Slack, LinkedIn, and Facebook, they discussed the collection of personal data and online identities. For free services, Sarah warned that “you are paying in different ways with your identities”. They pointed out the online environment can influence how much data people will willingly give over. Beth commented, they’ve found something that entices us enough to realize that they are doing the same thing as if a stranger came up to us and said, “Here’s $20, give me your name and your address and where you work and all the names and contact of your friends”. We would never do that, but for a little free networking and to look good online and massage our own profile and how happy our kids are, we will do it. And we won’t even take money for it.

During this focus group discussion, other women shared advice similar to Beth’s on staying safe in online environments and protecting digital identities. Based on personal experiences, they encouraged each other to be cautious of the information they provided to social media sites, marketers, and phishing scams.

Interacting in safe online environments was a value that participants in both focus groups shared. Megan discussed experiences in other online networks where she felt less supported,
where interactions from users could be “crusty and mean” and “hostile”. Being part of an online space where self-identified women in technology knew each other and where they felt like they could ask questions and be supported was essential to the women. When asked about what made YYJ Tech Ladies feel supportive and welcoming, Lydia appreciated the moderation of the Slack workspace.

The moderators are very conscientious about creating a safe space. And there have been times where conversations went out of hand, and moderators step in and say "Nope, we don’t do that,” and I’m very grateful because it is so nice having a safe space where you’re like “I really have no idea what the hell this is. Maybe one of you ladies can help me.” It’s so nice to have that.

Support

One of the themes in the women’s accounts of participating in YYJ Tech Ladies was the support they experienced. When the women asked technical questions, expressed frustration, or sought advice, they felt that other YYJ Tech Ladies members listened and understood them. Feeling heard is significant in contrast to their descriptions of engaging in other stories of hostile online environments and feeling like an outsider in technology spaces. In a previous study of women's online networking, empathy among members facilitated responsive and supportive environments (Donelan, Herman, Kear, & Kirkup, 2009). Supportive environments and interactions can also contribute to women's learning and professional development by providing useful information for coping. YYJ Tech Ladies is a space for some of the women, where they could share their experiences with gender in technology spaces and seek support. In particular, they shared advice on how to explain to their co-workers when the language they use makes them uncomfortable, when they feel like they are representing an entire gender in their
workplace, or how to negotiate their salary. These interactions provide a resource and sense of community for women as they navigate technology spaces.

The interactions and storytelling among YYJ Tech Ladies women also helped Sam reflect on her self-worth and her career path. Attending the *What I Wish I Knew About Professional Programming 10 Years Ago* workshop, she noted,

was really helpful for me because I went into my job right out of university and I didn’t really know anyone in tech. . . I knew a few men in my program who had pursued it, definitely no women. So, my first few years were pretty rough, figuring out whether I belonged at my job or if I actually liked my job or if I was just doing my job because that’s what you do out of university. And then when I went to that workshop, just seeing other women asking the same questions I had asked and also hearing answers to what makes a good job or what is instrumental for doing the job or how to enjoy where you’re working. And it just re-inspired me, like ‘Oh yes, I do like my job. I love problem-solving. I love working with the business on these pieces and giving people a solution that actually makes their lives easier’. And those were key points that I just really needed to hear at those moments.

To Megan, having YYJ Tech Ladies “makes me feel stronger, makes me feel more comfortable” as a woman in technology.

I think it's so helpful to know that there is this community of people who are also potentially dealing with those things and if you have trouble at work or something comes up, and you're like ‘I literally don't know how to deal with this,' you can reach out to other people and say ‘Has this happened to you?’ because they might have similar experiences.
The women shared how engaging in a supportive environment of YYJ Tech Ladies helped them identify and challenge struggles with self-confidence. Imposter syndrome was a common theme in the focus groups. Lydia describes how the support and role models she finds in YYJ Tech Ladies “makes me feel strong. I don’t shy away from responsibility knowing that there are other women out there with leadership roles and that’s what I’m aspiring to”. Kristyn reflects, “I think the whole imposter syndrome is always my biggest problem, so I know that it always comes up in the events that I’ve been to. And I definitely think that’s what helped me”. Sam illustrates how YYJ Tech Ladies is a place “to ask your silly tech questions” when “I feel like I should know this”. To Megan, the safe and supportive YYJ Tech Ladies Slack environment makes me feel stronger and less of an imposter because I know that other people are also doing it, so it’s not just me blindly stumbling around pretending to be good at technology things.

**Advice and knowledge-sharing.** As self-identified women in technology, the YYJ Tech Ladies community is not only a source of support; it is a source of advice and knowledge. Megan and Ariane illustrate how they use the Slack workspace for advice on issues they face and as a source of information for learning about particular topics through specific channels. When faced with a workplace issue or challenge, Megan shares how she seeks advice on YYJ Tech Ladies Slack

I'm the only developer on our team, and we've had two male developers for the rest of the time. Sometimes it's just nice to be like ‘This is ridiculous, and I don't know how to talk to them about it. Can I talk to you guys about it instead?’ And I will turn around and talk to them about it later.
For Ariane, YYJ Tech Ladies has helped her learn and engage with others who have an interest and knowledge in digital marketing. She reflects on her use of the YYJ Tech Ladies Slack workspace.

[It] has been a great source of information for me, especially when it comes to digital marketing. I’ve learned about different tools and approaches from other members of the community, and have been able to apply these to my job.

In their discussions of choosing learning and career opportunities, anxieties of making the right choices and being open to growth opportunities emerged. Supporting and advising other members as they navigate career development has been observed in previous YYJ Tech Ladies interactions. In the first focus group, when some women expressed anxiety about listening to their intuition and missing out on career opportunities, Beth advised them that saying no was ok.

It’s ok to say, ‘No. If I say no to this, I’m opening up the door for something better than this to come along’. It doesn’t mean something bad or horrible will happen, but it just might not be conducive to your own personal needs and where you might thrive. So, if you say no to something, sometimes it really leaves a path to go, ‘this is my place, this is my people or environment where I feel good about waking up in the morning, and I'm doing what I want to pursue'. So, don't ever condemn yourself for saying no to something. And it's ok to say yes to something non-traditional that other people will say ‘Don't do it'.

Learning how to listen to their intuition was an essential theme in the women's discussions about professional development. Kristyn talked about balancing her anxiety and intuition.
It’s hard to know. You think you’re feeling that way but “Is that just today, is that just tomorrow? Maybe I’ll get over it?” I find it’s just hard to know, to differentiate between a gut feeling that “this is actually not good”.

Ariane describes how her intuition pushed her to apply for a new opportunity in her organization. There was a difference between “this doesn’t feel right” and “I want to do this, but it scares the crap out of me”. It was always that kind of anxiety. I know I want to do this, and I know it will be good for me in the long run, but it’s so out of my comfort zone.

Now that I’ve started it feels a lot better.

Members of the first focus group shared stories where their intuition helped them as they made career choices. They described intuition as a gut feeling and anxiety. To Belenky et al. (1997), this is the process of discovering the inner voice and subjective knowledge.

Listening to intuition, setting boundaries, and taking action that aligns with their personal goals and needs is an ongoing challenge that most of the women described experiencing as they sought professional development and learning opportunities. Subjective knowledge values the inner voice and intuition (Belenky et al., 1997). A subjective knower realizes that “each person’s life experience gives a different view of reality from that of any other person” (p. 70). As the women described, listening to their inner voice can be anxiety-inducing; however, it can be a valuable learning experience for self-confidence and growth.

**Examples of supportive interactions from the focus groups and journal entries.**

Engaging in discussions and reflection of learning helped the women consider their next steps for their personal career development. Some of the women expressed feeling re-motivated to learn. Megan describes how discussing mentorship in the group helped her “expand my horizons and think about how people can help each other learn”. These discussions encouraged
Sam “to take on more of a leadership role at work instead of waiting for my lead at the time to
tell me what to do”, which in turn “got me notice and recognition from both the architect and
manager at my work” and “made me even more motivated to do my job and do it well”. She was
also inspired to “sign up for Battlesnake and try it out in a new language (Python) in order to
develop a new skill”.

Learning how to learn, for these women, allowed them to reflect during the process. As
the women shared their experiences, they reflected on how professional development and
learning made them feel. Some of the women described learning as something contributing to
personal growth. Ariane depicted professional development as “a person’s growth in a
professional setting”. Lydia felt learning “reinvigorate[d] my want to work . . . [and] help[ed] me
feel less tied and locked into my current career”. For Sam, professional development and
learning, helps her feel like

I'm growing and moving forward even if it might not necessarily help me in my current
career; it's helping me enjoy my current career or helping me feel less tied and locked
into my current career. So, it's just kind of very freeing.

Personal growth demonstrated how personal and self-directed the women considered their
learning and professional development to be. They identified how important motivation and
personal growth was to them. This is exemplified by the experiences they shared in learning
about how they learn.

The women in the second focus group explored how learning how to learn was part of the
process. They discussed this process in professional development and related this to their
experience in their undergraduate university courses. When Sam expressed frustration with
having to defend what she was learning in university, Lydia supported her; “you’re learning how
to learn in the process, which is what I always found university to be is learning how to learn.”

Sam agreed; “learning is never wasted even though a topic doesn’t come up every day.”

Realizing that learning how to learn was a valuable skill was a crucial point in the second focus group and something the three women related to their own professional development experiences — knowing what she wanted to learn and why was an essential factor in Megan's motivation to learn.

If I have to learn something because we're using it and I don't understand it, so I have to go out and learn, and I don't like it. . . . With a lot of the things that I do go out and learn I actually find really enjoyable and I find that it’s really interesting to learn about the different perspectives that there are on a particular technology.

The women were motivated to learn by having the choice of what to learn and the opportunity to consider their learning processes.

Awareness of their learning enabled the women to identify new strategies or apply existing techniques in their practice. Megan reflected on a recent YYJ Tech Ladies event on professional development where she remembers how flow charts had helped her learn in university and begins using them for her professional development learning; “I do flow charts that I haven’t made in 4 years. I find them really helpful to learn. So now I do that”. Sam identified how verbal processing and knowledge sharing helps her retain and understand what she learns; “I definitely find I have to be excited enough to tell someone as opposed to hiding it and keeping it to myself”. For Lydia, knowledge sharing in person and processing through the use of technology are strategies that work.

I find that if I read something and I don’t either write down notes or tell somebody else, I forget. So, I’m reading ‘How to Talk to Little Kids the Way They’ll Listen’ book – it's
not professional, but it's like therapy. There are nice little summaries at the end of each chapter, but if I don't tell my husband right away, I'm going to forget. I've actually started a Trello board for this book, so I can take away the bits that I've learned.

The journal entries and focus groups created opportunities for reflection on their learning and career paths. To Sam, this was a chance to recognize what she needed to learn effectively.

I personally learned that in order for me to truly absorb and retain knowledge or skills, I need to be in a safe and accepting environment. If I feel intimidated as opposed to challenged, I am less likely to admit to what I don't know in order to fully understand what I am learning.

Sarah learned to “keep an open mind, especially when it comes to professional development” and “always expect the unexpected in learning something new and interesting from others”. For Sam and Lydia, this reflective process helped them assess their current professional development and plans for the future. Sam shared how “reflecting on these questions and answers really made me assess what I wanted to do differently at work and what I was really enjoying at work”. Lydia realized that she needs to come up with a roadmap of what my learning goals are and what steps I need to take to achieve them. . . I've gotten rather complacent in my work that I don't prioritize that, and now I feel I feel stagnant.

This reflective process allowed the women to consider what they needed to learn and what was important to them.

The focus group interactions and journaling provided examples of how the women reflect on their learning and career development. Lydia was motivated "to come up with a roadmap of what my learning goals are and what steps I need to take to achieve them”. Some of the women
shared how they learned best and experiences where they realized they had the skills to mentor. Megan was encouraged to "think about how people can help each other learn" and Sam to "take on more of a leadership role at work". Being able to reflect on their skills and experiences with other self-identified women in technology in this research demonstrates how a learning community can facilitate individual and collective knowledge creation.

**Access to information and resources**

Information and resources from workshops could also be useful for having conversations with employers about compensation and roles. Lydia describes negotiating her salary for “$10k over what I was making before” when she started her new job. Attending the *How to Negotiate Your Salary* workshop helped her negotiate a raise by affirming her self-worth.

Having that reaffirmed and hearing of the other things you should be doing to get more for what you're doing was very useful, very helpful. I'm not very good at writing down all of my skills and having examples laid out for the next time, like Negotiating Your Salary did. At least I know my self-worth now, and that workshop helped to cement that.

Some of the women expressed how the focus group made them feel supported and inspired. Discussing professional development experiences and challenges helped Megan “feel less alone in the endeavour”. She describes feeling motivated by hearing about how others approach their professional development and that they also experience uncertainty or setbacks, because while logically I know there must be a lot of people doing professional development in their own time, it’s something I hear about really rarely from other women I know in the tech sector.

The interactions also helped her “get a more optimistic viewpoint” that “learning anything is useful in some way, which I had definitely lost sight of”. These discussions and interactions
changed Sam’s view of professional development. She describes her “initial impression of professional development [as] pretty formal”. The focus group inspired her to “get out into the [Ladies Learning Code] community more because participating in the focus group showed me how much there is to learn informally”.

**Examples of resources the women used to learn.** The women shared examples of the resources they use to learn. None of the women described formal learning contexts in their descriptions and stories of professional development. Lydia explained her interest in developing her leadership skills by attending a three-day leadership workshop. Megan and Beth both described learning about computer programming and languages at in-person workshops hosted by Canada Learning Code. Beth "took a one-day Introduction to Beginners Python that was affiliated with YYJ Tech Ladies". Megan attended an introductory course on machine learning and was "left thinking about the different ways I could apply the basics I learned in a way that would transfer to our business logic". She also used blogs and websites as a resource for learning about React, a programming language she uses at work.

To fill in that gap, I mostly just read blogs by people who are actually working on the technology that I have to work with. Like the guy who is on the development team that builds the React library... I read his blogs because he’s the only one I trust to know what he’s talking about.

To Sam, learning could come from reaching out to co-workers and “chatt[ing] about what we’re trying to figure out”.

**Role models and mentors**

Having role models in the YYJ Tech Ladies community encourages the women as they navigate their careers in technology. For Sam, seeing other women in tech helps “me realize that
I can be there one day” and has given her more confidence to be herself in a male-dominated environment.

I definitely think seeing other women in tech has taught me I can still have my own personality and be a woman in tech. When I first started, I was like ‘I need to be more of a bro right now to make sure I blend in, and I need to act a certain way to not draw attention. And then I'll just be really smart, and they'll respect me later’. . . And then I was like ‘No, I'm suppressing myself. I can't do this any longer'. So, I think seeing other women in tech has taught me that there are so many different personalities, male or female. Feminism isn't a personality; it's a belief. It taught me that I can be myself at work and I can have confidence and people should still respect me. . . It really taught me to get more comfortable as well as just feel more confident and not shy away from certain things, like leadership roles where I was like ‘I can’t draw attention’. So, it’s amazing just seeing how someone else in that position can make you visualize yourself in that position.

Mentorship also provided the women with role models and opportunities to see themselves as leaders. With fewer female leaders in executive and senior technical roles, the women appreciated seeing a future where they could be leaders in technology. For Lydia in her company where “you’re dealing with a lot of men”, “knowing that there are other women out there in leadership roles” inspires her as she works towards her own leadership goals. For Sam, finding a woman in a leadership role for a mentor has been challenging. After “reading Sheryl Sandberg’s Lean In . . . [and] realizing I can still be a woman and have a male mentor and aspire to have traits and values that this person has at work”, she was able to find mentoring relationships through her connections. However, female representation and role models in
technology leadership are still important. To Sam, seeing other women in tech showed her that “I 
can still have my own personality and be a woman in tech” and “that I can be there one day”.

**Becoming role models and mentors.** Learning how to be a mentor and a leader emerged 
as a common theme for the women as they reflected on their professional development. Most of 
the women shared accounts of when they began to see themselves as a mentor and leader. Megan 
shared a recent experience where she recognized she could be a mentor when she was recently 
training a new developer at her workplace.

I don't feel like I should be training anyone, I've only worked there two years now, but I 
don't feel like I'm experienced enough to do these things right. And you do them, and 
you're like ‘Wait I do know enough that I do know more than you so I can teach you 
these things'.

As they realized that they had valuable skills and knowledge to pass on, most of the women’s 
depicted a shift in confidence in their role as a mentor. Sam described when she realized she had 
the skills and experience to be a mentor.

My company just started [a mentorship programme], and I got to be a mentor. I’m like 
‘I’m not ready,’ but as I was talking with her, I’m like ‘Yes, I’ve learned so much in 
these three years I can pass on’. And it’s exciting as you start to share your knowledge. . . 
I’m actually learning so much.

Being a mentor takes practice as Megan and Lydia reflected on in the second focus group. 
Becoming a mentor is a process of learning how to understand what the mentee needs and how 
to support their learning and being able to reflect on their role as a mentor. These skills as a 
mentor can only be learned over time; having opportunities to practice these skills is important, 
according to Megan.
Being able to judge where they're actually at and how to get them from low to a high level – that's not an easy thing to be able to intuit. So being able to practice that with people who are willing to go through trial and error and figure it out would be really great. . . for anyone on any team. . . because you always have to be able to teach people something in your job.

Based on the women's stories, learning to be a mentor was a vital skill and learning opportunity for the women.

**Challenges to Learning and Leadership Development**

In their discussions, the women shared a variety of challenges that they faced in their learning and professional development. Supportive and positive workplace culture was necessary to their motivation and confidence to learn and develop skills in technology. Some of the women described a lack of support and unclear communication as barriers. Others explained how the fast-paced nature of technology and unclear career paths made it difficult to keep up with the rapidly changing information and find reliable resources. Some of the women expressed feeling overwhelmed by the self-directed nature of professional development. Additionally, a lack of confidence and motivation were also barriers to their professional development and learning.

**Workplace support**

The value of a supportive and positive workplace culture came up many times for the women. Ariane values a supportive workplace culture after experiencing a toxic work environment. Sam explained how important a supportive learning environment in her workplace is to her confidence and respect for her co-workers.

The fact that they don’t always support professional development means not all of my co-workers want to talk about what they’re working on the side or what they’re learning.
And I'm dragging it out of them at parties. . . I do think it's really important that the environment you're in is supportive and that you're learning and that everyone else is learning. Because as soon as I found that out about my coworkers, I was like 'They're doing that. I can do that!' Also, I respect them so much more if they're putting in the effort to learn and be better.

For Megan and Lydia, being part of smaller teams added to the challenge of learning in the workplace. Lydia is the only one in her role and described not “hav[ing] any resources”, except recently receiving funding for professional development for the first time. As someone who is actively seeking leadership opportunities, Lydia described how she creates opportunities for receiving feedback as she learns to mentor and lead.

My company doesn’t have that environment where you can be constantly guiding something or be guided – that kind of feedback. If I want it in my company, then I have to create it.

Megan is part of “a really small team” and wants more mentorship opportunities with her employer.

We would have these one-on-ones with my superior, and I would be like ‘What can I do better?’ and he's like ‘You're doing fine' . . . ‘If you mess up, I'll tell you'. And I'm like ‘If I'm just streamlining along on a flat rate, I need to know how to improve'.

Megan and Lydia articulated wanting more mentorship opportunities through YYJ Tech Ladies. YYJ Tech Ladies does not have any formal mentorship programme at this time. Megan, Lydia, and Sam believed this would be helpful to them and other women's learning and professional development.
Some participants in the first focus group shared logistic workplace challenges to building networks in the workplace and community. Kristyn and Ariane described challenges with relocating for work and working remotely. To Kristyn, relocation to other cities in Canada for work is another added challenge to building networks; “we can get moved, we just really don't know. That is part of the culture, and our work is—we really don't know when we'll be staying or going”. Workplace culture and relationships also came up for Ariane, who works remotely. "I do find that my company has a great culture. More than 60% of our company is remote, so that's a part that's like – there's company culture, and then there's remote employee culture". Information-sharing was another challenge that Beth described for her professional development. She identified that knowing what to learn, particularly within a larger organization, can be challenging.

You kind of have to be in a place where you're working to know what's going on. And you don't get to know what's going on because that's secure information. . . or they can't talk about them. There's no sale yet; there's no contract in place. Or it's something that's going to be publicly announced.

Workplace or industry logistics, including relocation, remote work, and proprietary information were factors that the women expressed were barriers to their professional development and learning.

**Fast-paced nature of technology**

The fast pace of technology is another challenge that two of the women identified. Though they were in separate focus groups, Beth and Megan discussed the challenge of keeping up with changing technology. To Megan, professional development was important in her role.
[Professional development is] something that's very necessary for the tech sector, especially as a developer since there are tons and tons of things to know and lots of new technologies emerging that you also need to be able to keep on top of.

While the fast-paced nature of technology excited Beth, it also was overwhelming. Having so many choices and new topics to learn was a challenge. She described how this impacted her professional development.

I still struggle with what's the best path because there are so many choices. And do I just capture it and go "that's interesting", but then there are five interesting things, now I want to do web development? Do I choose some Python? Do I choose some JavaScript? I don't understand some syntax of JavaScript, so I go to Ladies Learning Code or YYJ [Tech Ladies] or Canada Learning Code, and I get a little introduction in a safe and comfortable environment, but then I still don't know what's the next step for me personally.

**Finding reliable resources**

Finding reliable resources for learning about topics and languages was a challenge that the women in the second focus group shared. Megan found a lot of her information and resources from websites and blogs, most of them she described finding on her own. She expressed that finding reliable sources was challenging.

I find it really difficult to find something that works for teaching me to learn and also is a reliable source because it's hard to sift through the Medium articles by all the different people. And it's like ‘who knows what they're talking about?'

For Lydia, having trusted sources was a challenge: “there isn’t someone who says, ‘These are the resources you should find’. And there are so many different areas within that that it’s hard to
figure out where is that go-to source”. This challenge left Megan feeling like she had “a lot to sort of sift through”.

Identifying resources, courses, mentors, and support seemed like a solo endeavour. Even with their membership in YYJ Tech Ladies, Beth described feeling like she was “flying solo out there”. She identified a lack of standardized roles and professional organization as a difference in technology. Without a clear career path in their technology fields, she felt that it was difficult to know “‘what is my next step?’”. Not having a guidebook or formalized support was also an issue for Megan, who expressed “not knowing where to start”. Ariane felt that “there’s not even a clear path to get there educationally much less when you start your actual career”. Without a clear path, Kristyn articulated often wondering “do I be an expert in this one thing that I just started, or should I start something new?” in her self-directed professional development. Megan was “worried about spending so much time on something and just going down this wrong track”. To Beth, this meant that it was up to her to find the courses and learning opportunities available.

There's a lot of it around, and you gotta find it. If you're an avid reader and you soak information, you find these things. But other than that, they're not heavily promoted. . .

It's not like you can just throw it into a newspaper anymore and say ‘Here's this year's schedule of events. Pick and choose what you want’. There's no centralized system for it.

For most of the women, including Beth, Megan, Kristyn, and Ariane, a lack of clear career path and centralized resources were barriers to their professional learning. Having a resource hub of websites, courses, and learning materials in YYJ Tech Ladies is something that Megan suggested would help her and others with these barriers.
**Self-direction**

The personalized nature of professional development was a challenge that participants identified. Lydia reflected in her journal entry when she realized that learning and professional development is something that is very personal, and I have learned or come to accept that it is wholly up to me direct. Earlier in my career, I remember whining and complaining that I'm not learning anything new and that nobody told me what to focus on. Now I understand that it is up to me to determine and to get the time and money (hopefully) to learn.

Lydia’s account demonstrates the self-directed nature of this type of learning, something that Megan struggles with. “I think I have a tough time with it because I’ve always been told what to learn and so having to decide what to learn on my own is a learning experience in itself that I’m still working on”.

The rapid change of technology and having to do professional development on her own time are other tensions that Megan shared. She depicted professional development as a double-edged sword. On the one hand, I enjoy learning and experimenting with new concepts, but on the other, it can be frustrating to narrow my focus down to one topic for long enough to learn it, and then trying to pick that topic out of all the things there are to learn can be daunting.

Lydia expressed how tiring directing her personal development and finding mentors can be.

It’s all on me. All of my personal development has to come from me. No one else will give me a framework or give me a program. I have to come up with it myself, which is fine but it’s tiring, and I just want to curl up in a ball on the couch in front of the TV.
Megan described how she found the responsibility and self-directed nature of finding mentors as a barrier to her learning.

We have a really small team and basically everybody that I know in the same field. . . is at about the same level. And I know a bunch of obviously higher much more experienced developers through the YYJ Tech Ladies Slack. I know of them, and I see them around, and I recognize their faces, but I don't speak to them. Which, not to say they don't seem like incredibly welcoming people, I just don't want to go up to them and be like "Can you show me about React?" That would be so weird. So, I don't. . . in the actual community, I don't know where I would even start.

Some of the women expressed a lack of confidence and motivation as barriers to their learning and professional development. Having low confidence affects learners’ motivation and likelihood that they will continue learning in a subject. Naizer et al. (2014) and Sanders & Nelson (2004) link a drop in girls’ confidence to lower enrollment rates in advanced STEM courses, suggesting that low confidence affects their motivation to continue learning. Kristyn reflected in a journal entry that her “biggest barrier in learning is a lack of confidence and not knowing where to start”. Knowing where to start and motivation was another challenge for Megan.

I just didn't know how to start or motivate myself outside of having classes to do in university. . . it depends on the topic first of all. If I have to learn something because we're using it and I don't understand it, so I have to go out and learn, and I don't like it, then I get kind of grumpy. And that doesn't happen a lot. With a lot of the things that I do go out and learn I actually find really enjoyable and I find that it’s really interesting to learn about the different perspectives that there are on a particular technology.
Despite the confidence and motivation challenges that women expressed, these accounts indicate self-awareness and an ability to reflect, which may be essential skills in their self-directed learning.

**Summary of Findings**

Understanding how this support contributed to the women's learning and leadership development was the main focus of inquiry in this research. Using stories and experiences from seven participants (four who worked in technical roles and three in human or project-facing roles) through focus group and journal entries, the research identified three broad categories of the women’s experiences in technology, learning in YYJ Tech Ladies, and challenges they faced in their learning and professional development. Together these categories indicate that being part of a community of women in technology provides opportunities for identity and leadership development.

Interacting and engaging in communities provokes insightful learning opportunities such as expanding their view of professional development to mentoring and knowledge-sharing. For the women who participated in this research, sharing their experiences with others in the focus groups and reflecting on their learning in the journal entries shifted their views on professional development and learning. The focus group method explored women’s learning and professional development in a community of women and represented the types of social interactions among members that may occur in the community more broadly. These interactions provided examples of how members of this community support and affirm each other’s personal experiences and mentor and role model different ways of being women in technology. In their reflections, some of the women expressed that they began to see knowledge-sharing and peer mentoring as forms of professional development. In the journal entries, some of the women described how their
views of professional development shifted from a formal process of finding mentors and planning career paths to learning through experiences and informal interactions. These collective experiences provide space and support for women to learn in a safe space and develop their identity as a woman in technology, build agency, and grow. These themes will be discussed and contextualized in the next chapter.
Chapter 5: Discussion, Interpretations, and Conclusion

How Did YYJ Tech Ladies Contribute to Women’s Learning and Leadership Development?

Expanding on the findings from the previous chapter, I focused on the impact of space, relationships, and interactions within YYJ Tech Ladies contributes to understandings of learning and community. In this chapter, I will discuss how participating in a community of practice facilitated community building and change. Each section relates to the research questions posed in this study outlined in Chapter 1. Following my theoretical approaches and purpose, I used critical pedagogy and feminist pedagogy to interpret the findings and relate my interpretations to the literature. I will expand on these concepts as they relate to community building and change.

Building Community

Community building and learning are at the core of this research. Using the communities of practice concept (Hara, 2009; Wenger, 1998, 2010), these findings explored how community contributed to women’s learning and identity development. Community building is a practice grounded in feminist pedagogy (English & Irving, 2015; Fuller & Russo, 2018). Communities also support core principles of feminist pedagogy that encourage collaborative and embodied learning through storytelling and experience (Belenky et al., 1997; English & Irving, 2015; L. Fuller & Russo, 2018; Hooks, 1994; Nah, 2015). Since community was so central to this research, many of the findings related to how the women described participating and belonging to YYJ Tech Ladies. The safety and support they experienced within the community indicate that the women benefited from a sense of belonging, safe space, and collective learning experiences.

Creating safe spaces. Safety and space is a consistent theme in how the women described their experiences in technology and engaging in YYJ Tech Ladies. Creating a safe space for
women in technology was one of the purposes of YYJ Tech Ladies’ creation according to my previous discussions with two founders of the community. Five years ago, when they decided to create the Slack group, they intended to create a space where women would feel comfortable and supported. Safe spaces can build trust, which allows participants to share experiences and engage in reflexivity – integral practices in feminist pedagogy (English & Irving, 2015). They can contribute to a sense of community.

Engaging in the online Slack group provided an example of how an online network could be a safe space for the women. In contrast to some of the women’s stories of phishing scams, identity theft, and online harassment, the women described how they valued the safe environment of the YYJ Tech Ladies Slack group. Previous research highlights how feeling safe is not a given. A recent survey of female technology journalists in the UK found that 62% of the women reported abuse and harassment in both online and offline spaces (Adams, 2018). Some of the women reported similar experiences of harassment and mean messages in online spaces. However, some of the women shared how the moderation of the Slack group provided a sense of security. In my observations and experience, the self-selecting nature of YYJ Tech Ladies – women often join through an invitation from other members – also contributes to a safe environment for the women.

Using language. Use of language contributes to members’ sense of safety and belonging in online and face-to-face networks. In my experience, YYJ Tech Ladies signifies a space for women in technology to interact and build community. The name YYJ Tech Ladies was developed five years ago by the group’s founders to identify the group as a space for self-identified women in technology and business and highlight the underrepresentation of women these fields. The three words in the name seek to locate this community both geographically and
socially. “YYJ” refers to the airport call sign for Victoria, a technique for identifying specific cities, especially in online communities. “Tech” indicates the field and the purpose of this community – for people who work in technology fields or are interested in technology. "Ladies" visibly represents that the community space is for self-identified women in technology. As a historical term, "ladies" has been used to exclude women by class, ethnicity, and gender identity and identify women as less capable than men (Halem & Manion, 2017). From my observations, many of the members are aware of this history and choose to re-appropriate the term. Thus, YYJ Tech Ladies as a name and group creates a safe space and sense of belonging for self-identified women to engage with others both online and face-to-face.

Open membership. The open membership of YYJ Tech Ladies also contributed to a safe and supportive environment. As discussed earlier, YYJ Tech Ladies is an accessible community where any person can join the Slack group and attend workshops and events. Membership is based on self-selection, which can help to "reinforce a sense of culture and identity among the members" and enable informal knowledge-sharing and natural interactions in online environments (Hara, 2009, p. 104). Some members also have relationships with other members before joining, which can contribute to this safe space. In my experience, this creates a type of social confirmation where members feel more comfortable, even with members they do not know.

Sense of belonging and support. Being part of a community was significant to women's learning, leadership, and identity development. “Sense of belonging and identity” are at the core of communities of practice activities (Snyder & Wenger, 2010, p. 110). For the women, this sense of belonging made them feel connected to other members and the community as a whole. Belonging in a community can contribute to shared meaning-making, community accountability,
and collective action, values integral to feminist pedagogy (English & Irving, 2015; L. Fuller & Russo, 2018; hooks, 2003).

Having a supportive community and resource was essential to the women, especially those who were one of the few women in their workplace. As some of the women described, they experienced underrepresentation in computer science programmes and through male-dominated workplaces. Participating in a community for women in technology helped the women feel more confident and comfortable, knowing that there were other women out there. Ely et al.'s (2011) research suggest that women-only programs can "foster learning by putting women in a majority position" (p. 488). In YYJ Tech Ladies, some of the women described feeling more confident, self-aware, and stronger after hearing other women's stories at workshops or in the Slack workspace. These themes of community and support often emerged in the women's stories of learning.

**Facilitating collective learning.** The women's accounts exchanges in the focus groups reflected collective forms of learning, including sharing stories and knowledges. Collective learning includes learning within a community, among individuals and for the community as a whole. It is the process of knowledge creation among individuals and communities through storytelling, social interactions, collective reflection, and problem-solving (Mittendorff, Geijsel, Hoeve, de Laat, & Nieuwenhuis, 2006). These practices are similar to feminist pedagogy practices which use storytelling and sharing feelings and strategies to mobilize awareness and social action (English & Irving, 2015; L. Fuller & Russo, 2018). In YYJ Tech Ladies, these collective learning interactions sparked reflection, self-awareness, and awareness of other women’s experience in technology.
Knowledge-sharing. Knowledge-sharing was a crucial part of the women’s collective learning practice. It is an informal way of learning and transferring knowledge to others through social interactions and relationships (Mittendorff et al., 2006). In my observations, this practice allowed the women to keep up on the rapid changes and updates to technology, find relevant resources on learning, and seek advice. For some, knowledge-sharing was a way to learn and retain knowledge and a meaningful way to build relationships in the workplace and YYJ Tech Ladies. Knowledge-sharing is significant to women's online networking. In their (2009) study, Donelan et al. identified sharing career information as a motive for women participating in online networking. Knowledge-sharing in YYJ Tech Ladies also comes in the form of advice. Members seek advice both online and face-to-face in discussions, at workshops, or informal interactions with members. These instances demonstrate the importance of personal experience and community in YYJ Tech Ladies.

Supporting and validating experiences. Supportive and validating experiences contributed to learning among the women in YYJ Tech Ladies. In particular, the women reported the importance of feeling supported in YYJ Tech Ladies and at their workplaces. A lack of support was identified by Chuang (2015) as a primary barrier that women faced in continuing professional development. Having a community of women in technology to validate their experiences and other members as role models helped them feel stronger, more confident, and comfortable being a woman in technology. In collective learning, support and validation contribute to "a shared understanding and meaning" (Mittendorff et al., 2006, p. 302). These practices also contribute to holistic learning through social interaction and centring the self in the learning process (Fuller & Russo, 2018; Nah, 2015).
Incorporating personal experience and interests was another vital part of learning in YYJ Tech Ladies. Including personal experience and interests are practised in both collective learning and feminist pedagogy. Collective learning encourages group learning through collective reflection (Mittendorff et al., 2006). In feminist pedagogy, personal experience and interests help to understand women’s realities and lived experience (Belenky et al., 1997). Termed 'connected knowing' by Belenky et al. (1997), 'connected knowing' values personal experience, empathy, and relational interactions to understand how experiences and worldviews shape women's realities (Belenky et al., 1997).

Being able to express other parts of their lives is not only a way to include personal experience into learning, but it also can create connections with others who share similar identities. By focusing on personal stories and relationships, we can affirm women’s experiences and build a sense of community for the women as they learn and work. These practices can also contribute to community building and change (English & Irving, 2015).

Creating Change

Community and its development have a strong learning dimension in this regard: learning about change, enacting change, and resisting undesirable change. The intersection of learning, power, and resistance is central to women's causes and projects. Adult education brings this learning dimension into sharp relief and allows for transformation, both personal and social, as well as the possibility of substantive renewal and reinvigoration (English & Irving, 2015, p. 161).

Community can play a significant role in creating change. Creating space for integrating lived and collective experiences can foster community-building and engage women to create change (English & Irving, 2012). Thus, a community of women can catalyze awareness of
gendered experiences in technology and a network to mobilize change. In this context, the women’s descriptions of learning in YYJ Tech Ladies and their observed interactions in the focus groups demonstrated how participating in the community shaped their identity as a woman in technology and catalyzed change. An example of this is Sam’s description of how seeing other women in technology through YYJ Tech Ladies encouraged her to be herself, identify as a feminist, and work towards a leadership role. These interactions in the community contributed to change through consciousness-raising and supporting the women’s leadership development, which will be discussed.

*Consciousness-raising through stories and experiences.* Sharing stories and experiences provide opportunities for building awareness of similarities and differences in experiences in technology spaces. This sharing contributed to self-awareness and understanding the social conditions that contribute to women's experiences. Described as conscientização or consciousness-raising in critical pedagogy (Freire, 2014) and feminist learning in feminist pedagogy (English & Irving, 2015), these practices work towards creating a "collective understanding of social conditions in order to claim and open up spaces for participation and to change power relations" (p. 161). Consciousness-raising, in this context, included understanding the underrepresentation of women in technology and developing self-awareness and confidence.

*Underrepresentation of women in technology.* Through interactions in the YYJ Tech Ladies Slack and the focus group, the women demonstrated greater awareness of women's underrepresentation. Specific discussions included media representations of gender issues in technology spaces such as harassment and discrimination, male-dominated culture, and belonging. Hearing personal experiences from others developed the women’s awareness of how underrepresentation of women and gender stereotypes impacts women’s experiences and other
women’s interest in technology careers. These stories help to develop a collective consciousness of the social conditions and strategies for shifting the power relations (English & Irving, 2015). An example of this comes from my personal experience. Hearing stories from other women have made me feel less alone and confident in challenging gender stereotypes through my volunteering in YYJ Tech Ladies and Canada Learning Code and my work.

*Self-awareness and confidence.* Learning in a community also contributes to the development of self-awareness and confidence. Personal determinants, including self-awareness and confidence, can affect women's career decisions (Jaeger, Hudson, Pasque, & Ampaw, 2017). Sharing experiences and supporting one another facilitates women’s agency and self-confidence (Kim, You, & Yeon Park, 2016). For the women in this study, being able to hear from other women about career challenges they have faced facilitated their reflection on their skills and abilities. Others shared how they found discussions of imposter syndrome, the fear of “being exposed for not being the expert [their] role suggests” (Walker, 2017, p. 362), helped them understand that this was common. Realizing this normalized their fear and anxiety and gave them the language to identify this fear. Seeing other women as leaders also increased the women’s confidence and interest in pursuing leadership roles themselves.

*Supporting women’s leadership development.* Membership in YYJ Tech Ladies supported women's identity formation. Identity formation is a relational practice shaped by participation in a community of practice (Ely et al., 2011; Farnsworth et al., 2016) and is particularly essential in leadership. Gender and gender stereotypes affect women's identity and confidence as leaders (Hancock & Hums, 2016). Thus, women's identity development through community-building and safe spaces is critical to women's leadership development (Ely et al., 2011). In YYJ Tech Ladies, discussions of being a woman in technology often come up. Some of
the women described feeling strong and comfortable being themselves and a woman in technology. From my experience, this identity for members is central to how they interact in this community and safe space and support is critical. However, visibility is essential, as well. Role models and mentors also contribute to women's identity formation.

*Role models and mentors.* Seeing other women in a variety of technology roles and stages in their career contributes to members’ leadership development. In technology spaces where the women are underrepresented, having role models is essential. Having visible female role models in leadership roles is shown to increase women's self-efficacy, a necessary factor for "career motivation and success" (Prescott & Bogg, 2014, p. 177). Visible female role models are also an important motivator and confidence builder for women (Prescott & Bogg, 2013). Role models and mentors can help women overcome internalised stereotypes and see more career opportunities (Jaeger, Hudson, Pasque, & Ampaw, 2017; Prescott & Bogg, 2014b; Wynn & Correll, 2018) — seeing other women in leadership roles inspired and motivated the women to continue working towards their leadership goals. Thus greater representation of women in leadership roles can help challenge gendered practices and motivate other women to enter technology fields.

Role models contribute to women's identity development and learning in YYJ Tech Ladies. They are particularly relevant to women's professional development, as identity is a significant personal determinant that impacts women's "career-related learning and decision making" (Jaeger, Hudson, Pasque, & Ampaw, 2017, p. 494). Seeing role models mentors in a variety of roles and share their own experiences helped the women see themselves as skilled technologists and that they were capable of advancing into leadership roles historically held by men. Observing other women in a variety of roles in technology share stories of their personal
development helped some of the women change their self-perception and seek opportunities for leadership and skill development. The visible role models provide positive representations of women as technology creators and leaders, thus contributing to women’s confidence and learning.

**Significance**

This study contributes to the research by providing a practical example of how a community can support women in technology as they learn and become leaders. The findings indicate how community-based learning can help share knowledge of gendered experiences, build confidence and self-awareness, and feel supported. Communities for women offer a safe space and sense of belonging for women who experience ‘chilly climates’ in their workplaces. They are a means for mobilizing knowledge among members and a source of professional development resources and advice. They also provide a professional network to help women navigate male-dominated industries and are a source of role models and mentors for women’s leadership development. Role models and mentors in YYJ Tech Ladies were a visible representation that women can perform a variety of roles in technology and were a source of encouragement for some participants in their own leadership goals. Thus, YYJ Tech Ladies is an example of how a community of women in technology positively impact women’s learning and leadership development.

This research explored how women learn in a community of self-identified women in technology by capturing the experiences of members of YYJ Tech Ladies. It confirms that communities for women provide much needed safe spaces, belonging, support, resources, and knowledge-mobilization. Exploring the experiences of members of YYJ Tech Ladies also yielded insights into the women’s values and needs for their continuing learning and leadership
development. They described challenges that they faced learning for their careers such as (1) lack of workplace support through professional development or learning-centred workplace cultures; (2) difficulty finding reliable resources; and (3) time, motivation, and anxiety for this self-directed learning. These findings can inform how workplaces and YYJ Tech Ladies can better support women. Participants also suggested ways in which YYJ Tech Ladies could provide further support through formalized resources (mentorship network and resource-hub). This information is helpful for YYJ Tech Ladies and other communities as they work to support women’s learning and leadership development.

**Future Research**

The insights from this research recognize that membership in a community of women in technology contributes to women's learning and leadership development. While this research captured experiences from women in a community of women in business and technology, the smaller size of Victoria, BC, the technology community and its demographics likely shape the experiences and realities of YYJ Tech Ladies members. Thus, research must be done in other contexts to investigate how different communities contribute to women’s learning and identity development. Additionally, more research is needed to explore community learning and leadership development for intersecting and marginalized identities from feminist pedagogy, queer theories, and critical approaches. By doing this research, we can contribute to creating social change, facilitating lifelong learning, building thriving communities, and supporting future leaders.

This research represented the importance of community in learning and professional development, especially for women in technology. While this research was able to identify how support contributed to the women’s learning and professional development, future research must
further explore these types of support. Research topics should include role models and mentoring relationships for women in technology and engaging co-worker and leaders in efforts to address ‘chilly climates’ and women’s underrepresentation in technology. Future research must also explore the process of leadership development for women and women’s experiences becoming leaders. Questions may include: How can feminist leadership practices support women’s leadership development? What types of relationships and interactions facilitate peer mentorship? These questions will further explore the role of community-building, relationships, and feminism for women’s learning.
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Appendix A: Recruitment Materials

**Invitation to participate (Slack script)**

Hi, I’m Melissa Hamer working as a graduate student in Education.

I’m working on a thesis project to explore how members of YYJ Tech Ladies have learned in this community. In this project, we will share stories of learning and how this has shaped our experiences in the workplace and in Victoria’s technology community. This will include creating two journal entries and a follow up focus group (approximately 3 hours).

I am looking for 5-7 people to participate, so please feel free to share with other friends who are YYJ Tech Ladies members. If more than 7 people volunteer, participants will be selected based on their availability.

Please contact me directly (private message) or at mhamer@uvic.ca if you are interested or for more information.

Thank you,

Melissa
Invitation to participate (Event script)

Hi, ladies!

I’m working on a thesis project to explore how members of YYJ Tech Ladies have learned in this community. In this project, we will share stories of learning and how this has shaped our experiences in the workplace and in Victoria’s technology community. This will include creating two journal entries and a follow up focus group (approximately 3 hours).

I am looking for 5-7 people to participate, so please feel free to share with other friends who are YYJ Tech Ladies members. If more than 7 people volunteer, participants will be selected based on their availability.

Please contact me directly (private message) or at mhamer@uvic.ca if you are interested or for more information.

Thank you,

Melissa
Appendix B: Participant Consent Form

PARTICIPANT CONSENT FORM

Project Title:
Collective pedagogy: the role of relationships in women’s learning and professional development

Researcher:
Melissa Hamer, Graduate Student, Curriculum and Instruction, University of Victoria, 250-532-4905, mhamer@uvic.ca

Supervisor:
Kathy Sanford, Curriculum and Instruction, 250-721-7804, ksanford@uvic.ca

Purpose(s) and Objective(s) of the Research:
Purpose
- Understand how relationships in a local community of self-identified women in technology contribute to women’s learning and professional development
- This project will work directly with members of YYJ Tech Ladies to collect and share stories related to these experiences.

Objective
- This research focuses on exploring women’s experiences in this female-identified technology community and how sharing their stories with each other could catalyze further action.

This Research is Important because:
- Women are still underrepresented in technology careers and leadership positions
- Much of the existing research focuses on how women can adjust to workplace culture instead of changing the male-dominated culture to be more inclusive for women and other minorities

Participation:
- You have been selected to participate in this project because you are a member of YYJ Tech Ladies.
- Participation in this project is entirely voluntary. Whether you choose to participate or not will have no effect on your membership in YYJ Tech Ladies or how you will be treated.

Procedures:
- There are two parts to this research
  1. You will be asked to share an experience learning as a member of YYJ Tech Ladies in two journal entries (written, video, or other media). The first journal entry will occur before the focus group. Participants will send these entries to the researcher, who will analyze these
entries and prepare questions for the focus group. The second entry will occur after the focus group.

2. The **focus group** will occur at a later date where all participants will discuss their entries and questions prepared by the researcher. This session will be recorded (video and/or audio) for data collection.

- **Duration:** 3 hours (approximately 1 hour for the two journal entries and 2 hours for focus group)
- **Location:** The journal entries will take place online and the focus group will be located at a workspace or UVic classroom.
- **Inconvenience:** The time commitment may be inconvenient for participation. All efforts will be made to keep the journal entries and focus group within the allotted three hours.

**Benefits:**
- May provide opportunities for self-reflection and community support
- Through sharing stories, you may be able to reflect on the challenges and successes you have faced and develop a greater awareness of your own learning and leadership development

**Risks:**
- You should not face any risks by participating in this research.

**Researcher’s Relationship with Participants:**
- The researcher may have a relationship to you as a fellow member of YYJ Tech Ladies.
- To help prevent this relationship from influencing your decision to participate, the following steps to prevent coercion have been taken
  - You have the right to withdraw at any time and the choice to have some or all of your data destroyed.
  - The researcher will not share the data with anyone else and will store all data securely.
  - You will see the results before they are published and have the right to request that some or all of your information be removed.

**Withdrawal of Participation:**
- You may withdraw at any time without explanation or consequence.
- Should you withdraw, you may choose for all or some of your data to not be used in the final results.
- It may be difficult to separate your individual data from the focus group. In this case, your data will be summarised and all identifying information will be removed.

**Continued or On-going Consent:**
- Throughout the process, you have the right to withdraw or remove your data at any time.
- After the journal entries, you may decide to withdraw your data and not participate in the focus group.

**Anonymity and Confidentiality:**
- Your anonymity will be protected by the removal of all identifying information in the results. All participants will be given an alias, however you may choose to use your real name.
- Your confidentiality will be protected through secure storage of data on local encrypted drives.
• All participants and the researcher will agree to keep all content of the journal entry and focus group confidential. The results will not be published without your review and you will have the option to ask for any information to be removed to maintain confidentiality.

If you choose to use your given name and to waive anonymity, please review and sign the Waiving Anonymity section.

Research Results may be Used in the Following Ways:
• Directly to participants
• In a report or presentation with the YYJ Tech Ladies community
• In a thesis
• In a published article
• In presentations at scholarly meetings

Disposal of Data
• Data from this study will be destroyed six months after the project is submitted. All electronic data will be erased, and paper copies will be shredded.

Questions or Concerns:
• Contact the researcher using the information at the top of page 1;
• Contact the Human Research Ethics Office, University of Victoria, (250) 472-4545 ethics@uvic.ca

Consent:
Your signature below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers, and that you consent to participate in this research project.

_________________________  ___________________________  ________________
Name of Participant  Signature  Date

A copy of this consent will be left with you, and a copy will be taken by the researcher.

Responsibility for Confidentiality

I agree to keep all content (discussions, results, identifying information) product and the identities of other participants confidential.

_________________________  (Participant to provide initials)

Waiving Anonymity

I consent to have my responses attributed to me by name in the results.

_________________________  (Participant to provide initials)
Appendix C: Data Collection Methods

Focus group questions

1. How would you describe learning for professional development?

2. What does learning for professional development mean to you?

3. How do you decide to learn a new topic or skill for your career?
   a. What resources or materials do you seek out?

4. How has your membership in YYJ Tech Ladies affected you?

5. How has being part of a community of women in technology and business affected you in your daily life? In your learning?

6. How do other members of YYJ Tech Ladies help you learn?

7. What kind of support have you found from YYJ Tech Ladies? (ie. advice, mentors, collaborators)

8. How has your participation in YYJ Tech Ladies affected your identity as a woman in technology?
Journal entry 1

This is an opportunity for you to share about learning and participating in YYJ Tech Ladies. Feel free to share in any medium that is most comfortable (written, audio or video recording, art).

This entry will be read by the researcher; however, you may choose to share this in the focus group.

Reflecting on learning in the YYJ Tech Ladies community

Tell me about a time where you learned in YYJ Tech Ladies.

- What did you learn?
- How did you learn (from others, from events/groups)?
- What was the result?
Journal entry 2

This is an opportunity to reflect on things that may have come up in the focus group.

Tell me about how you see learning and professional development.

- How have your ideas about professional development changed?
Appendix D: Thematic Analysis Maps

Figure 1. Experiences in YYJ Tech Ladies
Figure 2. Learning and Professional Development
Figure 3. Professional Development Barriers
Appendix E: Ethics Certification

Certificate of Approval

<table>
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<tr>
<th>PRINCIPAL INVESTIGATOR</th>
<th>Kathy Sanford (Supervisor)</th>
<th>ETHICS PROTOCOL NUMBER</th>
<th>18-1044</th>
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<tr>
<td>PRINCIPAL APPLICANT</td>
<td>Melissa Hamer</td>
<td>Expedited review - delegated</td>
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<td></td>
<td>Master's student</td>
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<td>Curriculum &amp; Instruction</td>
<td>APPROVED ON</td>
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PROJECT TITLE: Collective pedagogy: the role of relationships in women’s learning and professional development

RESEARCH TEAM MEMBERS: None

DECLARED PROJECT FUNDING: None

DOCUMENTS INCLUDED IN THIS APPROVAL:
- Draft journal entry and focus group questions_v2.docx - December 04, 2018
- 18-1044_Sanford_Hammer_Modification_CoA_2018-12-04.pdf - December 04, 2018
- 18-1044_Request for Modification_v1.docx - December 04, 2018
- HREB_18-1044_Summary of changes.docx - September 29, 2018
- Participant Consent Form_v2.docx - September 29, 2018
- Invitation to participate_event_version 1.docx - September 29, 2018
- Invitation to participate_Slack_version 2.docx - September 29, 2018
- Approval for Research Project with YYJ Tech Ladies.pdf - August 23, 2018

CONDITIONS OF APPROVAL

This Certificate of Approval is valid for the above term provided there is no change in the protocol.

Modifications
To make any changes to the approved research procedures in your study, please submit a “Request for Modification” form. You must receive ethics approval before proceeding with your modified protocol.

Renewals
Your ethics approval must be current for the period during which you are recruiting participants or collecting data. To renew your protocol, please submit a “Request for Renewal” form before the expiry date on your certificate. You will be sent an emailed reminder prompting you to renew your protocol about six weeks before your expiry date.

Project Closures
When you have completed all data collection activities and will have no further contact with participants, please notify the Human Research Ethics Board by submitting a “Notice of Project Completion” form.

Certification

This certifies that the UVic Human Research Ethics Board has examined this research protocol and concluded that, in all respects, the proposed research meets the acceptable standards of ethics as outlined by the University of Victoria Research Regulations.

Associate VP Research Operations
Modification of an Approved Protocol

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PROJECT TITLE: Collective pedagogy: the role of relationships in women's learning and professional development

RESEARCH TEAM MEMBERS None

DECLARED PROJECT FUNDING: None

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Associate Vice-President Research Operations

Certificate Issued On: 04-Dec-18