Girl Games : gender, technology and design for women's recruitment in Information and Communication Technology (ICT)?

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▶ **To cite this version:**

Frédérique Krupa. Girl Games : gender, technology and design for women's recruitment in Information and Communication Technology (ICT)?. Art and art history. Université Panthéon-Sorbonne - Paris I, 2018. English. NNT : 2018PA01H316 . tel-02724692

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UNIVERSITÉ PARIS 1 PANTHÉON SORBONNE

École des Arts de la Sorbonne - École Doctorale 279

Laboratoire de rattachement : Institut ACTE - UMR 8218

THÈSE

Pour l'obtention du titre de Docteur en Arts et Sciences de l'Art

Option Design

Présentée et soutenue publiquement en Sorbonne

le 30 Novembre 2018 par

Frédérique KRUPA

Titre de la thèse

Girl Games: Gender, Technology and Design for Women's Recruitment in Information and Communication Technology (ICT)?

Jeux vidéos pour filles: le genre, la technologie et le design au service du recrutement des femmes dans les Technologies de l'Information et de la Communication (TIC) ?

Sous la direction du Professeur Bernard DARRAS

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Summary

This dissertation focuses on gender, design and technology through the artifact of video games — technology products of masculine engineering culture – and the gendered link between those that make video games (Production) and those that play them (Reception). This research examines a sector of the video game industry devoted to pre-adolescent girls, which 20 years ago was the site of feminist entrepreneurship hoping to remedy the gender imbalance in ICT (Information and Communication Technology). While parity has been achieved in media consumption, technological production firmly remains a masculine pursuit. This three-phase constructivist study begins with the personality preferences (MBTI) and sex-role orientation (BSRI) of women in game development, highlighting their exceptional resilience to gender stereotypes, and concludes with an ethnographic study of children playing independent, gender-neutral video games at an afterschool program in Paris. Using pragmatic semiotic epistemology, this dissertation argues that the belief-habits of negative gender and technology stereotypes are the principal roadblock to gender diversity in ICT – limiting the number of women willing to transgress gender norms into masculine professions and creating a self-fulfilling prophecy through parents' gender-socialization that reifies the belief in masculine technological passion and skill while developing unequal gendered technological access and encouragement. The dissertation concludes with strategies for gender-neutralizing technology, including design heuristics for gender neutrality in children's digital experiences.

Keywords

video games – gender – design – technology - women in STEM

girl games – women in ICT – pragmatic semiotics – MBTI – BSRI

women in game development – feminist technology – design heuristics

design guidelines for children's interactive media

Résumé

Cette thèse se concentre sur le genre, le design et la technologie à travers l'artefact des jeux vidéo - les produits technologiques de la culture d'ingénierie masculine, et le lien de genre entre ceux qui font les jeux vidéo (Production) et ceux qui les jouent (Réception). Ma recherche porte sur un secteur de l'industrie du jeux vidéo consacré aux pré-adolescentes qui, il y a 20 ans, était le site de l'entreprenariat féministe espérant remédier au déséquilibre entre les sexes dans les TIC (technologies de l'information et de la communication). Si la parité a été atteinte dans la consommation des médias, la production technologique reste délibérément une quête masculine. Cette étude constructiviste en trois phases commence par les préférences personnelles (MBTI) et l'orientation de roles sexués (BSRI) des femmes dans le développement des jeux, en soulignant leur résistance exceptionnelle aux stéréotypes de genre, et se termine par une étude ethnographique des enfants jouant à des jeux vidéo indépendants et non sexistes dans le cadre d'un programme extrascolaire à Paris. Utilisant une épistémologie sémiotique pragmatique, cette thèse soutient que les croyances et habitudes des stéréotypes négatifs de genre et de technologie sont le principal obstacle à la diversité des genres dans les TIC - limitant le nombre de femmes désirant transgresser les normes de genre dans les professions masculines — et créant une prophétie auto-réalisatrice à travers la socialisation du genre par les parents qui réifient la croyance en la passion et les compétences technologiques masculines tout en développant un accès et un encouragement technologiques inégal entre les sexes. La thèse se termine par des stratégies de neutralisation de la technologie, y compris l'heuristique de conception pour la neutralité de genre dans les expériences numériques des enfants.

Mots-clés

jeux vidéo - genre - design - technologie - les femmes dans les TIC

jeux de filles - sémiotique pragmatique - MBTI - BSRI - technologie féministe

les femmes dans le développement de jeux vidéo – heuristique du design

Acknowledgment

My dissertation is dedicated to my father — who passed away shortly before its completion but provided unwavering support throughout my life despite his beliefs in inferior female scientific capabilities — and was written to instill doubt in his mind and the minds of others who believe that our biology predestines our skills, interests and future professions.

My heartfelt gratitude goes to all those that had a hand in making this dissertation possible. First of all, I want to thank my partner and children, prominently featured in my autoethnography, who bore the brunt of my limited availability these past few years with patience and grace. My parents, sister and inlaws also have my gratitude for their constant support.

I want to thank the women in game development that shared their stories with me and participated in my MBTI and BSRI studies. I am indebted to the management team at the Gaité Lyrique (2013-2015) that allowed my ethnographic study to take place in optimal conditions; Oscar Barda and Theo Kuperholc at the Gaité Lyrique Video Game Center made the yearlong study truly enjoyable and collaborative.

My thanks goes to Monique Gross, Marie Christine Bard, and Daphné Bard for their copy editing. All faults are my own.

Finally, I want to thank my thesis director, Bernard Darras, for his patience and guidance throughout this process, as well as my dissertation's jury members for their considerable time and effort. I come out of this research a different person than when I started.

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1. Introduction: Female Technological Trouble

Women have had a conflicted relationship with technology since as far back as the first mechanized sewing machines that entered mid-19th century homes. As mechanization claimed to free up women's time from backbreaking labor, rising standards of cleanliness filled whatever void might have been created by the new "labor-saving" devices. (Forty 1986, 94-119).[1] Male designers and engineers of appliances were now confronted with a new end-user: female housewives and domestics. These new consumers — deemed to be simple-minded and feeble compared to men — were considered to be the least capable of end-users. Women quickly became symbols of a design's user-friendliness. After all, if a woman could operate it, anyone could.

Figure 1.1 1900 Kodak Brownie Camera & 1960 UK Mini magazine advert © Advertising Archives

[1] Forty, A. (1986) *Objects of Desire: Design and Society Since 1750*. Thames and Hudson.

Feminist technology studies researcher Paola Tabet argues that men's control of the production of technology, tools and weapons has been the key to masculine domination and patriarchy since hunter and gatherer cultures.[2] Cynthia Cockburn would add that men have continually reasserted and reorganized industries to protect and maintain masculine control of key industry positions with each technological disruption[3], and that masculine engineering culture, like the microwave oven, continues to shape women's domestic experiences when cooking the family meal.[4] J.C. Kaufmann noted that masculine mastery of domestic technology (e.g., power tools or lawn mowers) is valorized while feminine mastery of domestic technology (e.g., programmable washer/dryers or ovens) is considered unremarkable and menial.[5]

Examples abound of problematic sexist designs that flow from masculine engineering culture to a population that is much more heterogenous. For example, early air bags designed for the adult male biomorphic distribution killed small women and children. iOS Healthkit 8 — meant to be a "comprehensive health tracking application" — did not track any female reproductive health issues in its first release, even though a person's number of steps and blood alcohol levels could be tracked.[6] Artificial Intelligence applications that initially did not respond to higher pitched female voices or responded to crisis such as rape or battery with jokes or sarcasm, and photography

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[2] Tabet, P. (1979). Les mains, les outils, les armes. *L'homme*, 19(3). 5-61.
Tabet, P. (1982). Hands, tools, weapons. *Feminist Issues*, 2(2), 3-62.

[3] Cockburn, C. (1983). *Brothers.* Sage Publications.

[4] Cockburn, C., & Ormrod, S. (1993). *Gender and Technology in the Making*. Sage Publications.

[5] Kaufmann, J. C. (2014). *La trame conjugale: analyse du couple par son linge*. Armand Colin.

[6] Alba, D. (2015) Finally, you'll be able to track your period in iOS. *Wired.*

apps that were unable to properly render dark-skinned individuals or who tagged them as primates, are just some of the highly publicized design failures[7] that result from Silicon Valley's white male monoculture and its selective myopia.

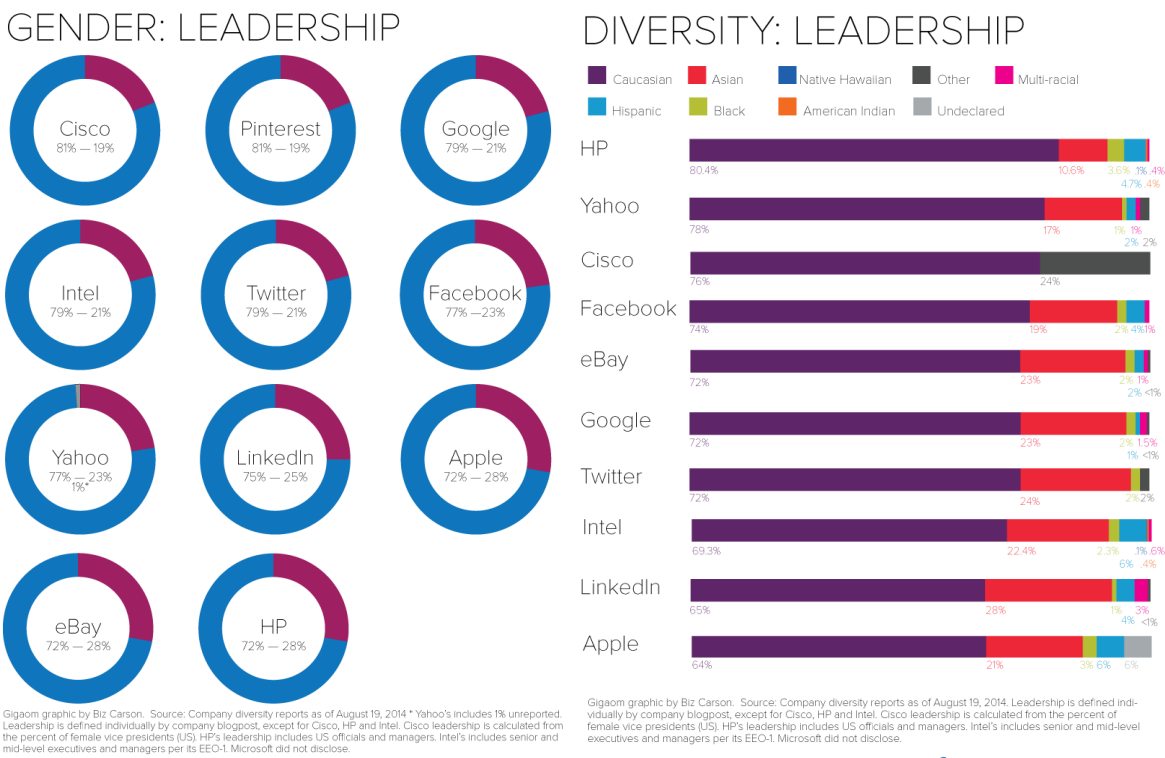

Figure 1.2 Gender & diversity leadership positions at GAFA firms. 2014. ©Gigaom/Bill Carson[8]

This dissertation focuses specifically on video games as technology products of masculine engineering culture, and the gendered link between those that make video games (Production) and those that play them (Reception). My research examines a sector of the video game industry devoted to pre-adolescent girls, which 20 years ago was the site of feminist entrepreneurship hoping to remedy the gender imbalance in technology.

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[7] Wachter-Boettcher, S. (2017). Technically wrong: sexists apps, biased algorithms and other threats of toxic tech. WW Norton.

[8] DeAmicis, C., & Carson, B. (2014). https://tinyurl.com/pudxrn4 (retrieved May 5, 2017)

1.1 The Solitary Feminine Pursuit of Technology

In 1988, I first got my hands on a primitive 3D animation program in my Industrial Design program, and I became enamored with the possibilities offered by computers. I eagerly explored the nascent Internet, early web browsers, scripting languages, and the web's increasingly powerful social dimensions: in chat rooms, bulletin boards, and later in social media sites. I had no friends that shared my technophilia — this was a solitary activity. But I knew there was a growing community of like-minded souls out there that I could join if only I had enough intelligence, ambition and determination. I did not just want to use technology; I wanted to understand how it worked, so I could design new technology.

International Game Developer's Association (IGDA) Demographic Survey 2005

	Male	Female
Ops / IT / HR	53%	47%
Writing	70%	30%
Mkt / PR / Sales	75%	25%
Production	79%	21%
QA	87%	13%
Executive	88%	12%
Visual Arts	89%	11%
Design	90%	10%
Audio	90%	10%
Programming	95%	5%

I entered the Information and Communication Technology (ICT) industry by a side door and never looked back. Having worked in new media, game and software development for nearly 20 years, the gender disparity I've encountered at every firm I worked for or with has always been extreme. While I didn't pose this question in my first fifteen years in ICT, in a moment of doubt I started to ask, "Why are there so few women in this field?" (Fig. 1.3)

Figure 1.3 Gender divide in the game development workforce, 2005. IGDA

After all, the work is creative, fun, interesting, challenging, and relatively well paid. The production tasks are quite diverse and require very different skill sets – social and communication skills for teamwork, logic, analytical skills, rigor, and attention to detail - not just math-skills for programming. Programming is just a portion of the production process. A critical one, but by no means the only type of work. Teamwork is a crucial and often underestimated aspect of the work. No particular physical strength or endurance is required, and workplaces are generally relatively clean and comfortable indoor offices. The fruit of our labor serves to entertain and educate people. These job descriptions all sound female-friendly, so why is there such gender disparity in ICT?

While this question initially sounds naïve to people I talk to - as if I were questioning an obvious or natural state of being - I often get told women aren't interested in technology. Women don't play video games. Women do not like math. Can't women please just leave introverted males' last ivory tower (much like an endangered wildlife refuge) undisturbed?

The stakes however are too high in a world where engineering and technology jobs command an ever more important share of the global economy, financial prestige and power to convince half of the population to just keep out. Therefore, I decided to explore the link between gender, technology and design through the artifact of video games for girls and ask if they can be an effective strategy to bring more women to ICT. As an artifact, girl games were once a beacon of hope in feminist strategies for bridging the gender divide in computer usage; they would allow girls to catch up to boys and a natural progression towards ICT education and professions would ensue.

This scenario has not quite played out as desired. While the gender-divide may no longer exist in computer usage, the grand ambition of greater female participation in production has not followed. Research shows that female percentages have fallen in ICT education and production since women's peak in 1985, when women earned 35.8% of CS degrees to 14.5% in 2013. How can this be?

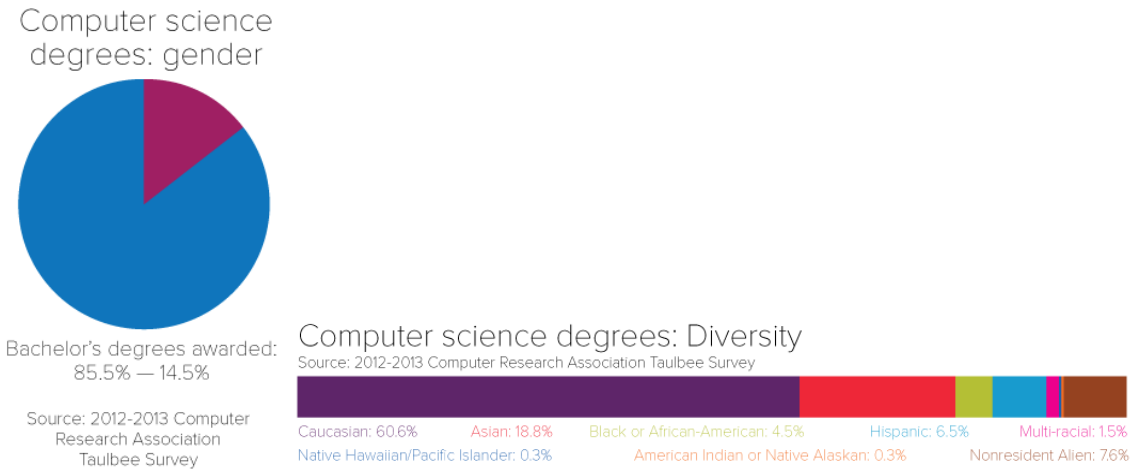

Figure 1.4 Gender and diversity statistics[9] for U.S. Computer Science degrees, 2012-13 © Gigaom

If we assume my question is a valid one, we quickly discover a "Chicken and Egg" situation. Fewer women are entering the traditional pathways into the profession (see Chpt. 2, Fig. 2.2), and there are low retention rates for those that do. This state of affairs has led to numerous and exhaustive studies on possible causes and recommendations for bridging this "digital divide" or the "leaky pipeline."[10] Isabelle Collet (2005) found an interesting counterpoint that while the number of French

[9] https://cra.org/resources/taulbee-survey/

[10] Gurer D. and Camp T. (1998). *Investigating the Incredible Shrinking Pipeline for Women in Computer Science- Final Report.* National Science Foundation Project 9812016. Griffith, M. and Moore, K. (2006). *The Women in IT (WINIT) Final Report*. Funded by European Social Fund and The University of Salford, Spring 2006. AAUW (Hill C., Corbett C., & St. Rose A). (2010). *Why So Few? Women in Science, Technology, Engineering, and Mathematics*. Camp, T., Adrion, W. R., Bizot, B., Davidson, S., Hall, M., Hambrusch, S., & Zweben, S. (2017). Generation CS: the mixed news on diversity and the enrollment surge. *ACM Inroads*, 8(3), 36-42.

women studying computer science remained the same, their numbers were dwarfed by an ever-increasing influx of male students.[11]

Liberal feminists focus on equal rights, opportunities, and salaries for women and girls; in liberal countries, liberal feminism is considered the norm. In my Conclusion, I will explain why this is a limited way of viewing the problem, like "rearranging deck chairs on the Titanic", to use a hackneyed expression.

While women make advances in most disciplines, beliefs in male intellectual superiority and female technological incompetence are being reinforced through popular literature and popular culture. Essentialist dichotomies are still being brought up as valid reasons for the lack of women in technological disciplines, and the toys and games provided to our children attest to that. Girl Games? Hair styles, fashion, boyfriends and pets… Boy Games? Shooters, driving, sports and war games… Gendered games reify other gender stereotypes through their genres, subjects, gameplay and aesthetics. By separating out a group of users – girls – as needing a special approach to technology, its association with masculinity is reinforced.

So can girl games help recruit more women to ICT production the way that video games were motivators for a tech career for almost all my male colleagues? The short answer is no. Using pragmatic semiotic epistemology, my dissertation uses designed artifacts - video games for girls - to explore and discuss the role of gender and technology stereotypes as belief habits that help maintain male domination in ICT.

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[11] Collet, I. (2005). *La masculinisation des études d'informatique Savoir, Pouvoir et Genre*. Sciences de l'éducation. Nanterre, Paris X. Collet, I. (2006). *L'informatique a-t-elle un sexe? Hackers, mythes et réalités*. Editions L'Harmattan.

These belief-habits are the principal roadblock to its gender diversity – limiting the number of women willing to transgress gender norms into masculine professions on one hand, and creating a self-fulfilling prophecy through parents' gender-socialization that reifies the belief in masculine technological passion and skill while developing unequal gendered technological access and encouragement for their daughters.

Stereotypes are culturally co-constructed, reductive images that derive their stability through their repetition. They significantly lighten our cognitive workload through automated decision-making processes that we do not doubt. The gender and technology stereotypes we will focus on in this dissertation can be classified as a dichotomy: stereotypes of women's technological incompetence, stemming from hypothetical weaknesses in math, science and cognition on the one hand, and male technological hyper-competence in the stereotypes of scientists, hackers, geeks, and gamers on the other.

1.2 Girl Games Movement

One of the earliest concrete attempts to correct the technological gender-divide occurred in the 1990s with the Girl Game Movement. After the phenomenal success of *Barbie Fashion Designer*, which was not a game, the girl game movement sought to increase girls' interest in digital technology through video games made for the then-inexistent female market. Fun, pleasure and play would allow girls to catch up to boys technologically. Feminist entrepreneurs founded companies like Her Interactive and Purple Moon to produce a series of games like the *Nancy Drew* and *Rockett* series to

reach the female market, specifically pre-adolescent and adolescent girls. This movement hoped and assumed that girls' technological gameplay would be a natural gateway to increased female participation in ICT production. (Cassel & Jenkins, 1998)[12] Feminism had to meet the messy realities of fighting for toy store shelf space, and many of these early titles focused on point and click, narrative role play that were sometimes criticized for their lack of feminist ambition. Tech savvy was the by-product of girl games which made girls more familiar with computer hardware, software and peripherals.

It's been nearly 20 years since the movement's birth. After Mattel bought out and killed off Barbie's competition, girl games have morphed from an idealistic feminist movement to one synonymous with fashion, make-up, shopping and care-taking games. These new "pink" games seem to strive for little beyond creating female consumers and reinforcing gender stereotypes that encourage girls to get in the habit of being objectified through constant attention to their appearance and of getting personal satisfaction from the care of others.

Video games can be a force to encourage girls to explore rather than follow prescribed paths, to question stereotypes, to develop interests in how things work, and build self-esteem and persistence. Though this does not need to be through a specially circumscribed technology, loaded with other gender stereotypes like subject matter, gameplay, and/or aesthetics that reinforce technology's "serious" masculine norm by accidentally reinforcing girls' hackneyed or trivial interests. Girl games

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[12] Cassell, J. & Jenkins, H. (Eds). (1998). Chess for Girls. *From Barbie to Mortal Kombat: Gender and computer games.* Cambridge: MIT Press.

emphasize girls' "outsider" status. The key may lie in what is currently produced in the independent video game market which is less concerned about political agendas than pushing aesthetic and gameplay boundaries beyond traditional genres and creating original, powerful experiences through technology for boys and girls, and men and women. The video game market will be discussed in Chapter 6.

Are games enough to increase women's participation in software production? Probably not. Nonetheless, video games address the problem where it starts. If pre-adolescent and teenage girls cannot develop an affinity for technology, a critical mass will not accrue to question and change immature practices of a relatively young industry when compared to more mature audio-visual professions like the film or television industry. Without a doubt, games are not the only route towards ICT production; early social media on the Internet's was a much stronger pull for me. Chapter 5 explores women in game development's sex-role orientations and domestic contexts and highlights a surprising absence of video games in these accomplished ICT women's list of favorite childhood toys. It remains to be seen if this is a generational effect.

Games have proven to have desirable effects on our cognition (Green & Bavelier 2003, 2007, 2011, 2012, 2017)[13] and on our mental health (McGonical 2011)[14]. A

[13] Bavelier D., Green CS, Schrater P., & Pouget A. (2012). Brain plasticity through the life span: Learning to learn and action video games. *Annual Reviews of Neuroscience*, 35, 391-416. Green, C. S., & Bavelier, D. (2003). Action video game modifies visual selective attention. *Nature*, 423, 534-537. Green, C. S., & Bavelier, D. (2007). Action-video-game experience alters the spatial resolution of vision. *Psychological science*, 18(1), 88-94. Green, C. S., & Bavelier, D. (2012). Learning, attentional control and action video games. *Current Biology*, 22, 197-206. Green, C. S., Kattner, F., Eichenbaum, A., Bediou, B., Adams, D. M., Mayer, R. E., & Bavelier, D. (2017). Playing some video games but not others is related to cognitive abilities: A critique of Unsworth et al. (2015). Psychological science, 28(5), 679-682.

game's power lies in its subconscious achievement through pleasure and satisfaction, a sense of control, and a feeling of challenge, accomplishment and pride. These are important intrinsic motivators and can, in the right circumstance, encourage a child to consider an ICT career later on. However, the games we put in the hands of children, as I explain in Chapter 6, do not necessarily deliver those positive qualities in equal amounts. Parents should be cognizant of what their children are playing and strive to be as active and involved in video game selection, purchase and gameplay for their daughters as they seem to be for their sons.

1.3 Dissertation Structure

Chapter 2 serves as an introduction to the terms and issues that this research builds upon. Starting with an auto-ethnography to establish my position as a researcher, I use my background in technology and design to encapsulate all the ways that gender asserts itself over a lifetime: from my early domestic sphere with two scientific parents; to negotiating my education with hesitant technological encounters that grew to solitary technophilia; to my professional evolution in academia and software development where I first encountered the Imposter Phenomenon; and final analysis of my current domestic sphere with my family's video game habits, in particular those of my two children that highlight how legitimacy and belonging come into play. I then explain the terms and issues of the research domains that span gender, design and technology.

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[14] McGonigal, J. (2011) *Reality Is Broken: Why Games Make Us Better and How They Can Change The World.* Penguin Group US, Kindle Edition, Feb. 2011.

Of particular importance in Chapter 2, pragmatic semiotics from U.S. scientist and philosopher C.S. Peirce (1839-1914)[15] provides the cycles of habit-taking that explains how beliefs in gender stereotypes are used to make sense of our milieu and influence our actions in rapid, automated, subconscious processes. This sense-making is called semiosis and can occur on three levels: micro-semiosis where gender stereotypes can be called as interpretants within a sign; meso-semiosis in which sense-making occurs through a network of signs, like accumulating cultural capital[16] or gamer capital;[17] and macro-semiosis which form culturally co-constructed gender ideologies that are reinforced through social norms that dictate appropriate professions, behaviors, clothing, emotions and interests for males and females with a belief in a strict sex and gender dichotomy.

Design comes into play through the artifact of video games for girls that reinforce gender ideologies. Video games for girls in this dissertation includes not only the "feminist" games of the 1990s but also its consumerist offspring such as those found on websites like barbie.com, girlgames.com or girlsgogames. While pink and pastel colors may or may not be the dominant aesthetic in girl games, what differentiates "pink" games discussed in chapter 2 from the gender-neutral artistic and independent video games discussed in chapter 6 are girl games' reliance on gender

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[15] Peirce, C. S. (1974). *Collected papers of charles sanders peirce* (Vol. 5). Harvard University Press.

[16] Bourdieu, P., & Passeron, J. C. (1970). *La reproduction éléments pour une théorie du système d'enseignement.* Collection Sens Commun, Editions de Minuit. Bourdieu, P. (1973). *Cultural reproduction and social reproduction*. Tavistock.

[17] Consalvo, M. (2007). *Cheating: Gaining advantage in videogames*. Mit Press. Harvey, A. (2015). *Gender, Age, and Digital Games in the Domestic Context* (Vol. 3). Routledge.Harvey, A. & Shepherd, T. (2016.) When Passion isn't Enough: Gender, Affect and Credibility in Digital Games Design. *International Journal of Cultural Studies*, 20(5), 492-508

essentialism for subject matter that reinforce stereotypical gender roles of female self-objectification, socialization and care-taking of others. Gender-neutral games use neutral subject positions that are not grounded in gender stereotypes, opening up the possibility of shared universal experiences, and they push the experimental boundaries of gameplay beyond stereotypical gender preferences of point-and-click for girls and fast-action-reflex for boys.

Chapter 3 is the literature review of publications used for in my dissertation and will be of interest to researchers working in similar domains or towards similar goals. Those that simply want the conceptual leap to my research program may skip this chapter. My Literature review methodology starts with key word searches, an A to C coding of my bibliography by proximity to my research subject - with "A Publications" containing at least 3 keywords - and extends to a quantitative and qualitative meta-analysis of my bibliography, with a particular focus on the "A Publications." My conceptual map explains how the most pertinent research on gender and video games articulate themselves according to different themes in the Stakeholder's Network Model (Darras & Belkhamsa, 2016). The chapter concludes with a geographic analysis of "A Publication" researchers and networks.

In Chapters 4-6 we will explore how these gender and technology stereotypes play themselves out in Production and Reception of the Stakeholder's Network Model to continually define technology as a masculine monoculture that others (women, LGBTQIA[18], ethnic minorities, the elderly, the disabled, etc.) must adapt to but can

[18] https://lgbtqia.ucdavis.edu/educated/glossary.html

never be a natural part of. ICT's masculine milieu is neither natural nor neutral; rather, these beliefs reify masculine control of technology and access to ICT's most valuable and strategic positions.

My research process is constructivist and was executed in three phases. The first two (Chapters 4 and 5) focus on women in game development, and the last phase (Chapter 6) focuses on Parisian 9-11 year old children playing in an after-school video game workshop. Each chapter will introduce the initial idea that lead to a hypothesis; choice of methodology; advantages, limitations, and constraints of the methodology; findings; and a discussion of issues raised or answered from this research phase. I do not believe in the neutrality of the researcher, and therefore I include problems I encountered that make either the data or my findings problematic. This is particularly explicit in Chapter 5. As a feminist researcher, I have grown suspicious of researchers who do not openly acknowledge their biases or subject positions, and who posture as neutral observers while trying to confirm masculine technical or scientific superiority at all costs. Once you have been taught to look at the beliefs and values of researchers and examine their methodology, subject selection processes, assumptions, and ideologically tinged conclusions, it is hard to go back to heroic scientific posturing.

Chapter 4 looks at the personality preferences of women in game development. This phase began during my literature review of "pipeline" problems that seemed to ignore that perhaps not all women were cut out for ICT work. The women I knew from my software production career were strong-willed, rational iconoclasts. I had yet to dive down the rabbit hole of evolutionary and biologically determinist

research, only to discover its unconvincing, biased methods. Perhaps ICT women's personalities were "different." I used the Myers Briggs Type Inventory (MBTI) —a controversial instrument – because its 16 categories are ubiquitous in educational counseling and job placement, and to be able to compare my results with other published databases. My findings did not disappoint me, but the key to women's resilience in ICT lay not in their detached rationality (in fact there were much more Feeling than Thinking preferences), but in their resistance to rules, norms and stereotypes (a strong preference for iNtuition[19] over Sensing). Most importantly, 47 % of my 94 self-declared women were from MBTI types that comprises less than 4 % of female high schoolers (INFJ and INTJ). The other important finding was that men in game development have more heterogenous personality preferences, specifically Sensing men that do believe in rules, norms and stereotypes and believe in their rightful place in the ICT industry. ICT has a need for protocol-based, less creative production work as well. This research reinforced the importance *beliefs*, or more specifically of women's *doubts,* in rules, norms and stereotypes.

Chapter 5 focuses on the sex-role orientation of the women in game development from my MBTI study. The Bem Sex Role Inventory (BSRI) is an instrument to measure how one aligns one's self-concept and subject position to gender stereotypes. In the end, using the same method for obtaining participants, I only had 14 participants after four weeks, and I explain in more detail why subject recruitment may have been so disappointing. The succinct explanation is that gender role orientation for technical

[19] The spelling of iNtuition with a capital N is an MBTI convention, meant to differentiate the intuition (N) preference from Introversion (I). My dissertation follows this convention; iNtuition refers to the MBTI preference, not the traditional definition of intuition. The MBTI is explained in greater detail in chapter 4.

women is a sensitive and difficult subject that straddles opposing systems of values where femininity and scientific/technical competence are in direct conflict. The follow-up discussions we had around these women's childhood domestic sphere and inspirations to enter ICT yielded some valuable common ground like a supportive parent, working mothers, and the importance of hands-on tasks in childhood. A few came from traditional, highly conservative families and entered the field through self-motivated rebellion.

Chapter 6 moves to the observation of children in the after-school workshop at the Gaité Lyrique cultural center whose video game center specializes in independent and artistic games. My ethnographic study used the known but discreet observer and started with a questionnaire whose findings proved much more intriguing than the children's gendered gameplay observations, illuminating the pivotal influence of parents' gender stereotypes on their children. Cooper & Weaver (2003) explain how public performance of computer skills is anxiety producing and creates a performance reduction of out-group members' performance through stereotype threat (Steele & Anderson 1995). The center's open-plan, glass-walled design certainly could lead to this increase in female anxiety. However, this phenomenon was present in beginners regardless of sex, rather than just in girls. This finding shows the pay-off, 20 years later, of relative gender parity in ICT media consumption.[20] All participating children by the age of 9 had at least played on a parent's smartphone and had been

[20] Entertainment Software Association (ESA) (2017). *Essential Facts about the Computer and Video Game Industry*. http://www.theesa.com/wp-content/uploads/2017/04/EF2017_FinalDigital.pdf (retrieved April 18, 2018)

introduced to computers at school. Children with older siblings have much earlier access to video game technology than first-born children.

A major finding was in the gendered difference in parental implication. According to the children's declarations, parents were more involved in the game selection and purchases of video games for boys (59%) than for girls (25%); boys' video game budgets were more heavily subsidized by the parents than for girls. Girls had access to less technology compared to their male classmates (often on shared touchscreen devices with other members of their family); to a narrower variety of games that were frequently low cost or free-to-play casual games; were introduced to technology later in childhood; and had more domestic control of screen time limits to just weekends. According to the children's declarations, Parisian parents, even those that play video games themselves, do not seem to consider video games as a necessary or beneficial activity for their daughters and were usually not involved in a critical games selection process for them, resulting in girls' lackluster, narrow list of favorite game titles. These tech savvy-neglected girls need to exert much more effort to find worthwhile games and negotiate their purchase — without an active peer network to share information with unless they engage in gender transgressive play as "tomboys."[21] These girls may have had access to technology, but not to the same *quality* of technological access as the boys. I also present two case-studies of outliers: the passionate girls who manage to carve significant gamer expertise as less supervised youngest children of large families and the disinterested boy who had

[21] Thorne, B. (1993). *Gender Play: Girls and Boys in School*. Rutgers University.

access to a salon console but did not care for video games. Both of these case studies address gender transgressions and their social stigmas.

Finally, in Chapter 7, I give a conclusion that discusses the importance of doubt - to encourage change by addressing the incoherencies and manipulations in ICT's masculine monoculture on multiple fronts. At the same time I present the argument that too much doubt could be counter-productive. Beliefs and habits are stable elements meant to lighten cognitive processing and are very resistant to change. Changing cultural beliefs is a long, arduous socially-co-constructed process that requires vigilance, pedagogy, patience and perseverance. Cultivation Theory might provide a template to speed up the cycle of new habit-taking. After making a case for gender-neutralizing technology, the chapter concludes with heuristics for designing gender-neutral children's digital experiences.

2. Research Domain: Gender, Design and Technology

2.1 Auto-Ethnography: Gender, Design and Technology in Action

An auto-ethnography, or first-person inquiry, is a commonly applied research method in cultural studies that acknowledges the impact of the researcher's personal experiences on the research process, not as a neutral force, but one which may influence the researcher's interpretations (Genin 2011). Cultural studies and pragmatic semiotics situate the researcher not as a disinterested, distant observer but as a situated one immersed in a process, with biases and vested interests that affect not only how research is performed but how conclusions are drawn. In both cultural studies and pragmatic semiotics, a researcher's biases must be acknowledged for the sake of transparency. However, if all I wanted was to explain my initial research questions and state that I was feminist researcher, this could be resolved in just a few pages.

Auto-ethnography grounds the roots of my research on gender, design and technology. Reflecting on my experience as a "woman in tech" allows me to link philosophical debates and scientific studies to lived experience as many factors of my autodidactic background are relatively nuanced, as are the influences of my parents and sibling on my childhood environment, my education and early professional life, and my partner and children in my current domestic and professional milieu. Its length and detail are required to show how many of the social factors that have been pinpointed as causes for women's abandonment of ICT education or careers are imposed upon women, often beyond their control and operating subconsciously:

- Girl's solitary acquisition of technical competence (or with a friend or relative in a best case scenario), while boys enjoy social encouragement and a wider social network when developing their technical savvy.
- The highly-gendered social pressures of parenthood in a demanding career.
- Stereotype threat from being in an out-group, as well as the imposter phenomenon and notions of illegitimacy, that increase anxiety and reduce performance.
- Balancing social and professional identities that puts femininity in direct conflict with professional competence.
- Intersectionality and privilege, notably class privilege that insulates some technical women.

In the end, my seemingly singular experience as a woman in game development becomes strikingly common.

2.1.1 Parental Influences: Feminism and Science

A child of the '70s, I was the progeny of two scientific parents. My violin-playing, amateur-photographer father was a stateless political refugee, the son of a Polish coal miner. He earned a master's degree in chemistry and a doctorate in nuclear physics from the Université de Liège, where he met my mother. She came from a divorced but upper-middle class home and, after the birth of her two daughters, earned her master's in chemistry under of the guidance of Nobel laureate Ilya Prigogine, pioneer of chaos theory at the Université Libre de Bruxelles.

In hindsight, my mother preached feminism more than she practiced it herself, but it was clear from the start that my older sister and I were expected to excel in math and science and earn college degrees. We did not have a television growing up in Brussels and spent our time constructing homes and workplaces for our dolls. By current standards of helicopter parenting, we were given a huge amount of freedom as young children to

explore the vacant lots and outer limits of our suburban neighborhood at a very young age.

We followed my father's career from the suburbs of Brussels to the suburbs of Houston, Texas in 1976. Two years after our arrival in Texas, my mother began teaching chemistry at a community college and soon after became the head of its science department.

My sister and I were lucky not to have a brother,[22] because this spared us from the indignity of early gendered expectations. We were not exempt from chores such as mowing the lawn. We were shown how to change a tire, explained how gears or a belt drive functioned, and expected to understand how to maintain a car's fluid levels before we were allowed to drive the family car. We had access to a dark room at home to dabble in black and white photography. We regularly visited art and technology museums. We were taught to recognize the beauty of mechanical, chemical and physical systems.

The economist Anne Ardilla Brenøe (2017a&b) who studied firstborn children in Danish families looked at how sibling gender composition affects gender-stereotypical educational choices. She found that same sex siblings choose less stereotypical educational and career paths because parents impose fewer gender role differentiation. My sister studied architectural engineering and became a successful architect; I studied product design, specializing in UX/UI and system design.

[22] Brenøe, A. A. (2017a). Does Sibling Gender Composition Affect Gender-Stereotypic Choice of Education? University of Copenhagen. Brenøe, A. A. (2017b). Sibling Gender Composition and Preferences for STEM Education. University of Copenhagen. Brenøe, A. A., & Lundberg, S. (2017). Gender gaps in the effects of childhood family environment: Do they persist into adulthood? European Economic Review.

2.1.2 Texas: Land of Anti-intellectual Patriarchy

Art, design and science mixed seamlessly in our modernist Houston home filled with design from the 1960s and 1970s. My parents collected scales and exhibited scientific equipment as sculptures. We were unlike any of our friend's families; we were freaks by Texan norms.

As part of the U. S. "Bible-belt," Texas culture rigidly reinforces gendered norms in a hierarchical adolescent social structure that place the female cheerleader and the male football player in dominant adolescent social roles. Football games are major social events in contemporary Texas. The cheerleader's function is to celebrate the virile accomplishment of the football player; she dresses in revealing costumes that the otherwise prudish Texan educational dress code forbids other adolescent females. Even if we sought to fit in, our participation in this sexist ritual was strictly verboten by my mother. In the end, our perpetual "outsider" status inoculated us from peer pressure, as much as our adolescent self-esteem could bear. I believe that my strong resistance to social norms stem from my adolescence in Texas, where I realized that one should not adhere to social norms arising from religious and sexist beliefs when they are toxic to women.

2.1.3 Early Technophilia

My introduction to personal computers occurred in sixth grade. I was part of the Math club when our school acquired an Apple Lisa. We were taught basic programming that would make Christmas trees out of Xs. I was unimpressed by the graphic's crudeness and its lack of clear applications, but my mostly male peers seemed enthralled. In high school,

I avoided the typing and word processing class – considered a secretarial track. I focused on advanced science and math courses instead. My strategy was a bit shortsighted because typing is now a basic requirement in digital culture that I had to painfully learn on my own.

We finally acquired a television when we arrived in Texas. Our family never owned a video game console and only purchased a personal computer after I had left home for university. My best friend had an Atari Pong console that we played at her house. My friend and I occasionally frequented video game arcades, spending most of the time on crude driving simulations.

2.1.4 Education and Career Paths: Stereotype Threat and the Impostor Phenomenon

While my excellent academic performance in a mixed-sex setting and unwavering parental support allowed me to side-step any anxiety or pressure in school, self-doubt first manifested itself in my introductory computer programming course. Before starting university, I took a C programming course at a Houston community college where I was the only woman in the class. My curiosity was quickly tamed by exercises meant to interest next generation programmers: American football statistics and airline reservation systems. I felt anxious that I would confirm some inherent female intellectual inaptitude for programming. This was my first experience with a psychological phenomenon called stereotype threat (Steele & Aronson 1995)[23]. Stereotype threat decreases the

[23] Steele, C., & Aronson J. (1995) Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology*, Vol. 69(5), Nov 1995, 797-811. Spencer S. J., Steele C. M., & Quinn D. M. (1999). Stereotype threat and women's math performance. *Journal of experimental social psychology*, 35(1), 4-28. Schmader T. (2002). Gender identification moderates stereotype threat effects on women's math performance. *Journal of Experimental Social Psychology*, 38(2), 194-201. Steele, C., Spencer S. J., & Aronson J.

performance of subjects who are subjected to stress and working memory interference[24] (Bonnot & Croizet 2007) that stem from a fear of confirming a negative stereotype when belonging to a socially stigmatized group. Stereotype threat has been validated in over 300 studies and can be mitigated by a subject's gender identity, internalization of gender roles, how a task is framed, as well as well as identity salience to out-group status prior to the task[25]. Being part of a group associated with positive stereotypes creates the opposite effect, stereotype lift or stereotype boost. (Shih, Pittinsky & Ambady 1999) I didn't dare ask classmates for help because I didn't want to seem weak or unintelligent; although in hindsight, other students certainly struggled as well. I also neglected critiquing of our assignments that were insipid and inadvertently reinforced my out-group status or my 'unnatural' presence in the class. So, like my first programming experience in school, I came away feeling like programming was a 'wrong fit,' too awkward and unaesthetic.

In 1986, I moved to New York City to study product design at Parsons New School of Design, where I began working with pre-calculated 3D animation and computer-aided design software. These skills were relatively rare and in high demand, so I was hired upon graduation as my alma mater's adjunct faculty to teach computer-aided design courses. I

(2002). Contending with group image: The psychology of stereotype and social identity threat. *Advances in experimental social psychology*, 34, 379-440. Murphy MC., Steele CM. and Gross JJ. (2007). Signaling Threat: How Situational Cues Affect Women in Math, Science, and Engineering Settings. *Psychological Science*. October 2007, 18, 879-885. Bonnot V. & Croizet J.-C. (2007b). Stereotype internalization, math perceptions and occupational choices of women with counter-stereotypical university majors. *Swiss Journal of Psychology*, 66(3), 169-178. Bonnot V., & Croizet J.-C. (2011). Stereotype threat and stereotype endorsement: their joint influence on women's math performance. *Revue Internationale de Psychologie Sociale*, 24(2), 105- 120.

[24] Bonnot V. & Croizet J.-C. (2007a). Stereotype internalization and women's math performance: The role of interference in working memory. *Journal of Experimental Social Psychology*, 43, 857-866.

[25] High-achieving Princeton Asian female students were divided into 3 groups, each tested by creating a salient identity prior to testing excellent math skills: Asian (positive stereotype), Female (negative) or Student (Neutral). Stereotype threat and lift accounted for the discrepancies in their results. Shih, M., Pittinsky, T. L., & Ambady, N. (1999). Stereotype susceptibility: Identity salience and shifts in quantitative performance. *Psychological science*, 10(1), 80-83.

also acquired a Masters in Architecture and Design Criticism, served for three years as assistant editor at *I.D. Magazine* and became a visiting assistant professor at Rhode Island School of Design's Industrial Design Program.

In 1994, the University of the Arts' Industrial Design department recruited me to become their first full-time female faculty member in its 100-year history. I was at least 10 years younger than my male colleagues, and the significant age difference with the rest of the male faculty made me acutely aware that as a woman, I was a symbolic asset to a department. The department needed role models for female industrial design students, but this was a potential handicap to my credibility. The combination of my sex and my youth —and the difference with the older white male professors - could be interpreted as the hurdles of academia being lowered for the sake of diversity. In spite of the fact that my colleagues treated me as an equal, and students treated me with respect, I began to self-doubt again.

Among my prestigious colleagues — Klaus Krippendorf taught product semantics, Peter Stathis was chair, and I co-taught studios with Karim Rashid, then just a rising star in industrial design — I compensated by over-preparing and being very tough on students, experiencing what Clance and Imes (1978) called the Impostor Phenomenon.[26] Relatively common in high achieving women, this phenomenon manifests itself into "generalized anxiety, lack of self-confidence, depression, and frustration related to inability to meet self-imposed standards of achievement." (Clance & Imes, 1978, p. 2). As an overworked perfectionist incapable of internalizing my achievements, I believed that my abilities had

[26] Clance, P. R., & Imes, S. A. (1978). The Impostor phenomenon in high achieving women: Dynamics and therapeutic intervention. Psychotherapy: Theory, Research & Practice, 15(3), 241.

been overestimated. While this did not keep me from striving for more achievement, I never appreciated any of my accomplishments, and I thought my work was sub-par and did not merit its commendations.

2.1.5 Technophilia and the Impostor Phenomenon

When the first Netscape Navigator browser appeared, I became enthralled with nascent internet technology. Web development, email, and IRCs allowed me to nurture a network of like-minded peers no longer constrained by time-zones or distances. I finally saw beauty in internet's amazing complexity and understood its ground-breaking potential. I eagerly delved into hacker culture through books and magazines to learn as much about hardware, networks and software as I could, but this was a solitary pursuit.

Although initially planning to move to the Silicon Valley in 1998, I headed to Paris instead and started working as webmaster for a real-time 3D game middle-ware development company called Virtools. After my successful interview, I was told that I was their first female employee and the only female applicant out of a pool of 31 candidates. Instead of feeling secure about my unique set of skills and hard work, I felt the impostor phenomenon again. Instead of reassuring myself that I had a rare combination of useful and desirable skills in design, writing and technology, I only focused on what I was not: a certified programmer, a genuine hacker.

There was a clear hierarchy in Virtools' R&D department between *coders* who programmed in C++ and *scripters* who worked with interpreted languages like HTML, Javascript, etc. I was a mere scripter.

In a trend mirroring the career paths of other technical women, my career advancement occurred in the less prestigious departments managing web sites, networked software deployment, our webservers and technical documentation. I found kinship by joining the IGDA (International Game Developers Association) women's special interest group email list, coming into contact with some of the women who pioneered the Girls Games movement.

All in all, I really enjoyed working at Virtools, and when Dassault Systèmes purchased Virtools in 2006, our team became a diaspora. My former Virtools colleagues were intelligent, thoughtful and witty, and they remain a major part of my professional network. My partner and I met at Virtools, and we started a family: first, a girl and, six years later, a boy.

2.1.6 Technophilia meets Mommy Track

After the birth of my first child, I returned Virtools (Dassault Systèmes) as a part time employee, and my technical career stagnated. Before motherhood, I had been making as much as my partner, but with my partner's mission-critical role, we decided to reduce my hours to reduce our infant daughter's daycare presence. This was the beginning of our salary divergence.[27] To compensate, I returned to teaching as a part-time adjunct professor at Parsons Paris, now Paris College of Art (PCA). I finally left Virtools/Dassault Systèmes after the birth of my second child to become PCA's Chair of Communication Design.

[27] Fifteen years later, my partner, a programmer at a GAFA multinational corporation, earned four times my academic salary, not counting dividends and stock options.

In our final year at Dassault Systèmes, my partner and I started making Apps for iOS touchscreen devices like the iPhone and iPad under the name "Simple is Beautiful." We released 5 Apps that were lucrative and well received: two games, two drum-step sequencer music apps and a photo app. My partner programmed, and I handled the UX/UI (user experience/user interface), testing, documentation, marketing, communication and financial aspects of our various partnerships. I had finally found a way to design and be in control of our creative production. App publishing allowed us to control every aspect of our product without needing sponsors, editors or venture capitalists.

Simple is Beautiful was put on hiatus in 2013 when my partner was hired by a major U.S. GAFA[28] computer company as software developer with a non-compete clause, and my PCA Masters of Fine Arts in Transdisciplinary New Media curriculum that I had created, advanced in its NASAD accreditation process. It was time to get my PhD.

2.1.7 Domestic Sphere: the Petri Dish in my Living Room

My interest in gender diversity in technology is both personal and multigenerational. My parents were scientists who encouraged us to be curious about how things work and follow our interests, which encouraged my sister and I to go into technical creative professions.

My two children – a daughter and son born six years apart - grew up with technology as readily available as air and water, but even as a "woke" feminist, I see how we

[28] Acronym for Google, Apple, Facebook, and Amazon, but meaning any large computer or internet start-up that has achieved international success.

inadvertently replicate gendered expectations on our two children. Brenoe (2017a &b) found that mixed-sex siblings are subjected to more stereotypic gender socialization in the home compared to same sex siblings. [29] In mixed-sex siblings, parents tend to spend more quality time with children of their same sex and divide tasks and expectations along more traditional gender roles. Children then internalize their roles and expectation when choosing career paths and educational majors. As much as I wish my partner and I escaped these dynamics, we did not.

2.1.8 Gendered Activities, Media Consumption and Expectations

My first-born daughter takes math and piano lessons, while her younger brother is a competitive table tennis player. (Both are indoor extracurricular activities, more of a testament to bad Parisian weather than a desire to keep either of them confined.) He was encouraged to engage in competitive sports while my daughter engaged in only non-competitive sports and wasn't expected to continue them when she hit adolescence. Both had piano lessons as children. My daughter continues her formal classes while my son abandoned his lessons for a few years and spontaneously returned to playing but only to learn how to play his favorite video game music from YouTube tutorials. Nurturing competitiveness and physical activities in boys and indoor activities and artistic expression in girls are normative gendered extracurricular activities that can produce different professional gender roles in later life.[30]

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[29] Brenøe, ibid.

[30] Honig A. S. (1983). Sex role socialization in early childhood. *Young Children*, 38(6), 57-70.

Now in her last year of high school, my daughter is facing with trepidation having to choose a university major. She does not get the same encouragement to explore technological careers as her younger brother. It is naturally assumed by everyone in the family that my son – a video game fanatic - will follow in his father's footsteps as a coder and is less encouraged to develop his language and artistic skills, while my daughter – studious and multi-talented - has always hesitated between a dizzying array of possible university degrees and professional goals. My partner was very surprised to learn of her final choice in engineering. She had a hard time honing in to her future discipline, as if stating her interest in computer programming and bio-technology might create doubt in her abilities.

2.1.9 Domestic Policy and Control Mechanisms

When it comes to domestic policy concerning children's media access, our family is at the enthusiastic, extremely permissive end of the spectrum. We encourage our children to play what and when they want - in a fiber-optic connected home with at least 2 computers, a touchscreen tablet and smartphone for each family member, as well as every major salon and handheld console made in the past 20 years. Our annual video games budget resembles what most families spend on their transportation. Growing up, both children had access to a huge library of video games due to our professional interests, but only my son developed what could be considered a problematic gaming habit requiring that we set up automated time limits on his computers and living room consoles. We set up parental filters to monitor for unsafe web access on both children's devices. We disabled my daughter's parental filter when she turned 12 since she was having problems accessing 'normal' sites.

My son had parental content filters and automated, scheduled time allowances to reduce his screen-time and reduce conflict when it was time to log out. My son learned to hack around his parental controls when he was 11. His repeated hacking and work-arounds for these control mechanisms showed a level of creativity and initiative that impressed me. Knowing he had disabled his parental controls but still able to review his activities through our understanding and knowledge of his hacking methods, we decided to trust him. We now rely on our son's discernment and ability to auto-regulated his media consumption, but this is often still a source of conflict with his father.

My daughter always balanced her academic responsibilities and performance with her otherwise voracious media consumption (e.g. YouTube and Netflix in particular). We never used parental technological confiscation as discipline mechanisms with my daughter. With my son, homework and bathing are still regularly 'negotiated' with the threat of disappearing gamepads, keyboards/mice, tablets, handheld consoles, or wifi access. In other words, two children growing up in the same milieu — lax to rules framing access to technology — developed two very different media consumption patterns and relationships, with only one child's access considered "problematic" and in need of intervention and remedy. The children differ in their age, their birth order, their sex, and their personalities.

2.1.10 Masculine Technological Legitimacy and Belonging

My son seems to revel in the performance of masculinity in video game culture. He has a network of friends with whom he shares his passion. They discuss this at school and online in MMOGs (massively multiplayer online game) like *Minecraft*, *Terraria* and more recently *Counter Strike* and *Fortnite*. They compare hardware, exchange games, tips and

cheats. He builds his technological and gaming experience collectively and has leapfrogged in gaming skills over his sister. He builds his sense of masculinity from gamer culture. Sadly for me, it doesn't require a lot of imagination to see him as a hardcore gamer who will in a few years become a #gamergate footman defending his turf from female and minority interlopers that he deems illegitimate. He clearly feels legitimate in his technological interests in a way his sister, who is also a very skilled gamer, could never proudly exhibit. In moments of bravado, he even resorts to taunting me about my computer knowledge — which is still way better than his but rarely displayed in our living room.

When my daughter started high school, she tamed down her passion for technology that she exhibited in early middle school when she played the *Legend of Zelda, Little Big Planet*, *Uncharted*, the *SIMS* and pink games like *Babydow*. She has a wide variety of friends and has navigated her adolescent academic milieu well-liked and popular. Sensitive to negative social cues, she did not want to be a social outcast or assume a geek-girl social role. Like most gender-transgressive activities, she plays alone or with family, all within reason. Her recent few forays into MMORPGs dampened her interest when she realized that all her teammates were 11-year-old boys. She spends a tremendous amount of time cultivating her social media life through blogs, Instagram, Snapchat, etc. and is now a user of technology, creating online content but using tools provided to her. Instead of being proud of her interests and fully engaging in them, she uses her energy to make herself a well-rounded individual, learning new skills like knitting, painting and programming in Python. Since she intends to study engineering at university, her solitary,

auto-didactic activities will prove to be beneficial habits that may help her overcome (if necessary) her minority status in her future ICT discipline.

In other words, what I observe at home is a microcosm of the dynamics played out in the rather solitary pursuit by women in technology. My son and partner both enjoyed warm receptions from peers and social reinforcement as they developed their passion for technology, while my daughter and I both had solitary, autodidactic apprenticeships of technology.

2.1.11 Skepticism and Bias

Even more troubling, my partner, like many of his colleagues, still believes that the lack of women in high-level programming is due to women's biological frailty or lack of interest rather than social conditioning for technical competence and competition. My partner and his colleagues are all highly paid employees of a top GAFA company (e.g. Google, Apple, Facebook, and Amazon) and work in a department of stunning homogeneity: a department of cisgender, heterosexual, upper-middle class, white males, 25-45 years old, who wholeheartedly believe they are part of a meritocracy. Steadfast in their belief that their stock options and high salaries merely reflect their superior intellect, they are unable to acknowledge the privilege that comes with being part of every dominant social category: sex, social class, sexual orientation, age and ethnicity. They are socially dominant and blind to their biases about who gets to join their ranks.

The only women programmers my partner knows in his very large company are two MTF transsexuals who program in Assembler, a very difficult, low-level language, which he believes is proof that these talented women are capitalizing on their initial 'male' biology

for their technological prowess. These technical women, who both transitioned after getting hired, most likely benefited from the 'white male' advantage before they transitioned, but instead of creating doubt in my partner's belief in male technological superiority, he continues to accept that innate biological sex differences, rather than social forces, facilitate career trajectories for one dominant group over another.

2.1.11.1 Influx of Men or Disappearance of Women from Computer Science?

As Collet found in her dissertation (2005), girls earning a French high school diploma (the Baccalauréat S) had stronger academic results than male students in all disciplines, including math, physics/chemistry and biology/geology except a slight 1.1% disadvantage in technology (p26), but this did not translate significantly into greater female enrollment in French STEM tertiary education in terms of percentages. Focusing on percentages is where STEM statistics can be misleading, because as Collet found in her analysis of French engineering schools, female students in computer science decreased in percentages since 1983, but only because of the huge influx of male students (p 31). French women in computer science programs in French engineering schools have seen a very slow overall progression that is simply dwarfed by the abundance of men going into computer science.

> *"We imprudently called our first article "The disappearance of girls from computer science" (Collet 2004) yielding to the habit of considering "men as the norm and women as the 'problem' and a 'sum of errors' (career breaks, part time employment, wrong career choices, etc.)(Persson 2003 p 270) In reality, we should have called it the "Influx of men in computer science" with the risk, admittedly, of making women even more invisible." (Collet 2005, p 31)*

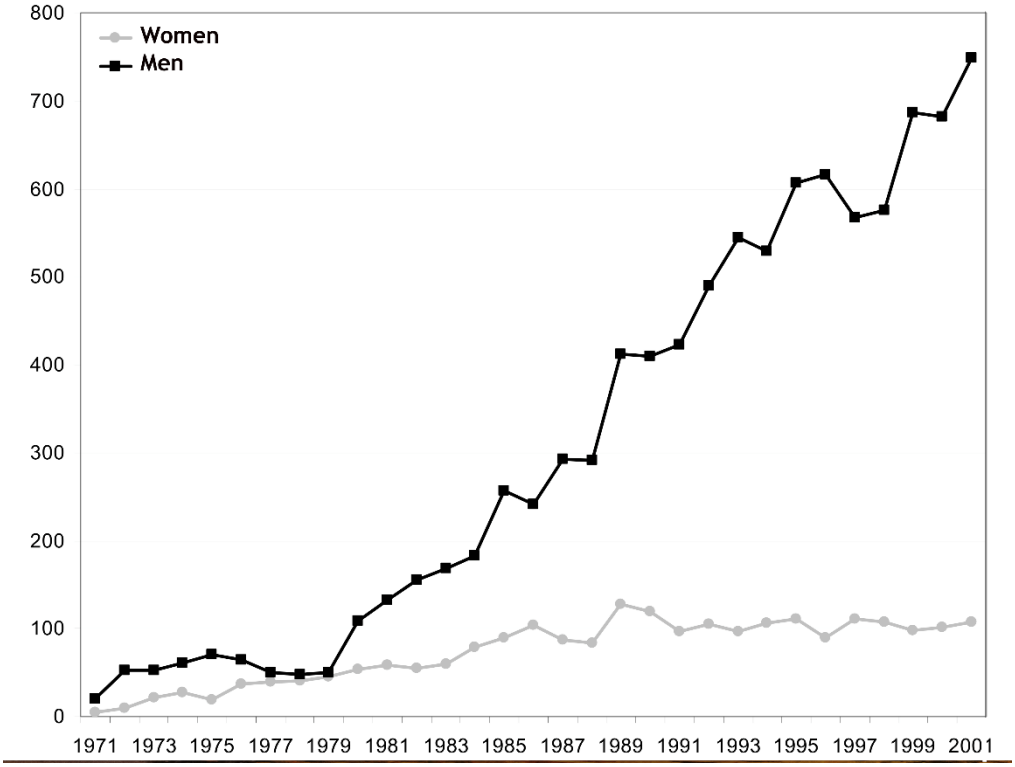

Figure 2.1 From Isabelle Collet's PhD dissertation, enrollment in 10 top French engineering schools.

It would be very interesting to see if the same pattern could be observed in the United States, but U.S. statistics are always presented in percentages. The few absolute enrollment numbers I could find, like MIT's[31] did not specify sex. If there is a huge incursion in male computer science students but timid growth in female computer science majors, percentages will follow the dismal statistics we see presented by the various reports on Women in STEM (Gurer & Camp 1998; AAUW 2010)[32]. (See figure 2.2)

[31] http://web.mit.edu/registrar/stats/yrpts/index.html

[32] Gurer D. and Camp T. (1998). *Investigating the Incredible Shrinking Pipeline for Women in Computer Science-Final Report.* National Science Foundation Project 9812016. American Association of University Women - AAUW (Hill C., Corbett C., & St. Rose A). (2010). *Why So Few? Women in Science, Technology, Engineering, and Mathematics*.

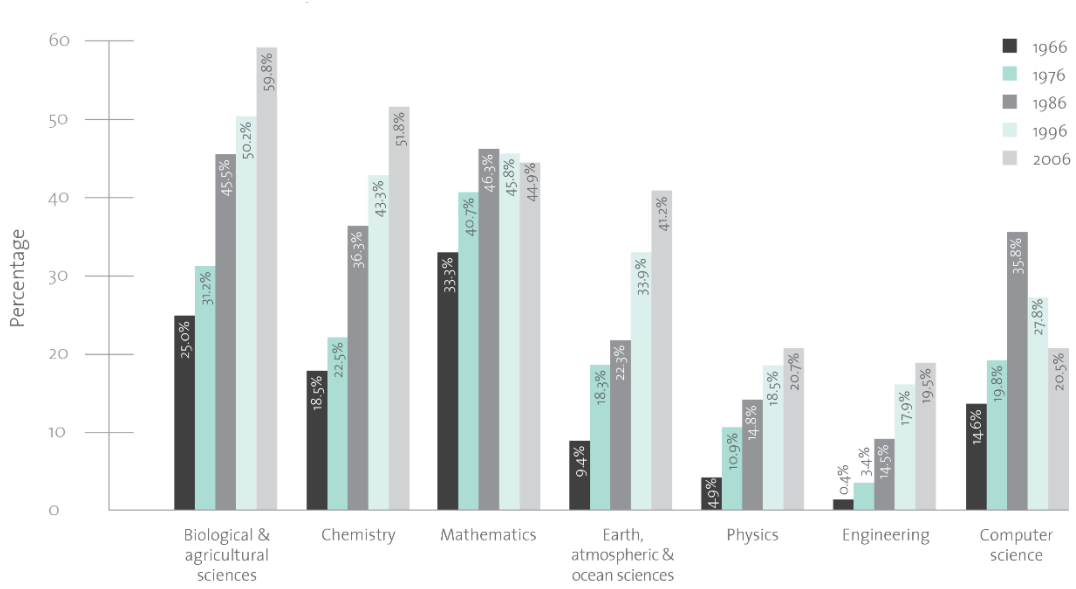

Figure 2.2: AAUW (2010) Bachelor's degrees earned by women in selected fields 1966-200

In a recent report called Generation CS: Computer Science Undergraduate Enrollment Surge Since 2006 from the Computing Research Association (Camp & Al. 2017),[33] the average number of computer science majors at doctoral granting academic units has more than tripled since 2006 and more than doubled since 2011, with a spectacular increase in non-majors into introductory computer science classes. The institutions also report an increase in female and under-represented minority students but, once again, the results seem to be mitigated by the greater influx of men.

[33] Camp, T., Adrion, W. R., Bizot, B., Davidson, S., Hall, M., Hambrusch, S., & Zweben, S. (2017). Generation CS: the mixed news on diversity and the enrollment surge. *ACM Inroads*, 8(3), 36-42.

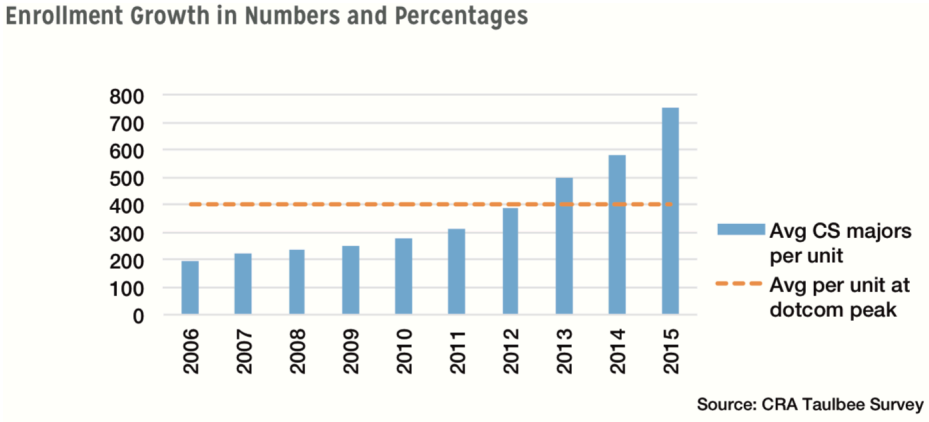

Figure 2.3 Average number of Computer Science majors per academic unit since 2006 from the CRA report Generation CS. (Camp & Al 2017) The dot com peak refers to CS enrollment in the late 1990s.

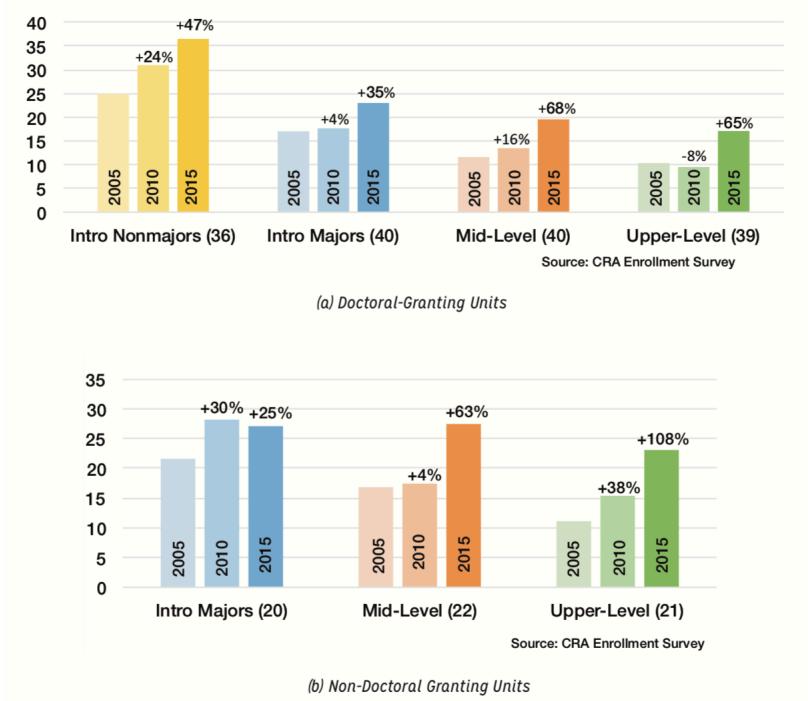

Figure 2.4 Median percentage of female students in the courses surveyed from the CRA report Generation CS. (Camp & Al 2017).

2.1.12 Technophilia: a Male Privilege?

Intense technological obsession, which my partner only sees displayed in males, makes him believe that this is a masculine condition. He does not realize the social price for displaying this intense passion is not the same for men and women. Males can engage in

hacking as a familiar and gender-appropriate pastime. Females are conditioned to be attentive to the needs of others therefore, any intense all-encompassing passion usually feels unacceptable to the women themselves. When this passion is linked to technology, its gender-transgression is even more socially stigmatizing, as Breton (1990) and Turkle (1988) indicated in their studies.[34] Men and women are not equally free to express their technological interests and doing so will result in different social repercussions (Ullman 2012)[35], but this desire to maintain a relationship with a machine and the belief in its disembodied intelligence is one of the cementing characteristics of the computer hacker, the IT tribe.

Both Breton and Turkle mention research that tries to explain divergent attitudes in the way women and men view and relate to the computer. For men, computers are machines, subjects that are hollow envelopes in men's quest for knowledge. Computers allow men to create programs that are parcels of the mind, to create technology as a compensation for their inability to procreate.[36] For women, computers are objects, utilitarian tools, because they have a different relationship to procreation.

Both Breton and Turkle critique essentialist gender claims, but they still present these stereotypical women=nature, men=culture hypotheses as reflecting the status quo in biological determinism. I take personal offense to biological explanations because the potential of disembodied intelligence is precisely what drew me to computers to begin

[34] Breton P. (1990). La Tribu Informatique. Metailie, Collection Traversés. Turkle, S. (1988). Computational reticence: Why women fear the intimate machine. In C. Kramarae (Ed.), Technology and women's voices: Keeping in touch (pp. 41-61). Routledge.

[35] Ullman, E. (2012). Close to the Machine: Technophilia and its Discontents. Picador.

[36] Breton 1990, p 52-56.

with — shedding limitations on physicality, space and time, creating something from nothing without using physical resources (aside from server farms, of course). Efficacious procreation has not reduced my creative desire in the least. The difference for me lies not with satisfaction due to my reproductive performance but in two factors that are rarely mentioned together in technology's gender diversity debate: the toll of caring for others and negative hacker/scientist stereotypes.

2.1.12.1 Wasteful, Superfluous, Selfish Passions

Even if I wanted to be a true hacker and lose myself in disembodied intelligence, I would not be able to devote the time required for true proficiency. I lack time and flexibility to get myself in a creative flow (Csikszentmihalyi 1990 & 1997) because I have been socialized to be attentive to the needs of others — to sacrifice my time, energy and concentration to the care and planning of my household and my employment. I would love to be able to dedicate myself to personal creative growth, but on the few occasions when I engage in an activity for pleasure, like when I go surfing or play video games, my extended unavailability to others is contested. When my partner leaves for extended business trips, my 'care-taking' workload does not change significantly. When I leave for an extended period of time, it is stressful on the rest of the family who distribute my chores among members of the family who kick it into high gear to clean, shop and organize the house just before my return.

Women's care-taking mental workload has a significant cost to those that run households, more often the female parent, who simply have too much to oversee to disconnect guilt-free in a time-consuming pursuit. (Haddon 2004; Harvey 2016)

My gaming is personal, solitary, reflexive and lacks showmanship; it fills the very brief interstices of my life that are unproductive. Like many women, I do not have the time to be wholeheartedly absorbed by any passion, having a career and household to run.

I play to relax, almost as a form of meditation. My favorite game genre is the puzzle or strategy game that I play on my half hour commutes; short games that I can do in a few minutes so as not to miss my metro stop. I also play at the end of the day, when I have finished my 'domestic shift', especially if I find the program we watch as a family uninteresting. If I commandeered the television with the game console, my gaming would be more legitimate to my family than playing alone off my iPad. When I get caught up in a game at home, it is assumed that what I am doing is a waste of time. This behavior is met with criticism and perceived as attention-deficit/multitasking.

2.1.12.2 A Good Scientist is a Bad Woman

The second hurdle to ICT gender diversity and embracing technological passion can be considered from a less personal perspective: the repulsive nature of gender stereotypes of scientists and hackers. Isabelle Collet (2005 & 2006) shows that stereotypes of scientists — ambitious, competitive, logical, rational, audacious, distant, independent, obsessed with object to the detriment of relationships, etc. (Aebischer 1988; Marro 1992; Vouillot 1993; Dhavernas 1995; Duru-Bellat 1995a) — closely match the stereotypes of

men.[37] This means that to adopt the manners of a good scientist, a person needs to adopt the manners of men — masculine gender roles.

While this may not be an issue for "cross-sex typed masculine" women[38] (see Chapter 5) or women with resilience to gender norms (see Chapter 4), people who believe in a pure gender dichotomy interpret these stereotypes with a belief that to be a 'good' rational scientist or engineer is to be a 'bad', unfeminine woman. On the flip side, a 'good' feminine woman, by her irrational, emotional nature, makes a bad scientist.[39] (Bix 2014)

As ridiculous and essentialist as this may sound, culturally defined stereotypes are amazingly stable and persistent. Women who choose to work in gender-transgressive technical professions are constantly walking a tightrope between being professionally accepted versus being socially accepted according to gender roles and beliefs that they have no control over. Choosing a gender-trangressive profession requires that women negotiate their gendered performance of identity[40] between conflicting social and professional contexts (Bury 2011). Resilient personality types aside, it is no wonder many women prefer to follow the relative comfort of a feminine profession, even if it means less economic security or prestige.

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[37] Collet, I. (2005). La masculinisation des études d'informatique Savoir, Pouvoir et Genre. Sciences de l'éducation. Nanterre, Paris X., p 46. Collet, I. (2006). L'informatique a-t-elle un sexe? Hackers, mythes et réalités. Editions L'Harmattan.

[38] Cross-sex typed refers to the BSRI, Bem Sex Role Inventory, created by Sandra Bem in 1981. Women who mostly identify with masculine-stereotyped sex roles are said to be cross-sex typed. Bem S. L. (1981b). Bem sex-role inventory: Professional manual. Consulting Psychologists Press.

[39] Bix, A. S. (2014). Girls Coming to Tech!: A History of American Engineering Education for Women. MIT Press.

[40] Bury R. (2011). She's Geeky: The Performance of Identity Among Women Working in IT. Herman, Clem (editor). *International Journal of Gender, Science and Technology*, Vol 3, No.1, 34-53.

2.1.12.3 A Good Hacker is a Bad Woman

As for the negative hacker stereotypes, the tribe coalesces around certain common values discussed by Breton and Turkle, such as love of technical mastery and creativity, but the ideal of disembodied intelligence and the abnegation of the body leads to negative hacker stereotypes relating to deficiencies in bodily health and hygiene, social skills and athletic abilities.[41] Isabelle Collet noted in her PhD dissertation (2005) on stereotypes and ICT career motivations that French male students but not French female students listed hacker stereotypes as the fourth most prominent reason for not studying computer science along with: "repetitive/monotonous," "inanimate/antisocial," "it's hard," and "stressful workplace." (p 157-8)[42] Only the male subjects reported stereotype threat from hacker clichés related to abnegation of the body, particularly obesity and sedentariness. None of the female students listed this as a reason for not studying computer science. But other research shows that a hacker workplace can be a repulsive issue for women (Margolis & Fisher 2002, chpt. 4)[43] and a major reason for women leaving tech. (Gurer & Camp 1998; Snyder 2014B; Thomas 2015)[44]

Pushing further her inquiry, Collet had French freshmen science students in fill out questionnaires of items that related to computer programmers, identified in table 2.5.

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[41] Breton, ibid, p 51.

[14] Collet, ibid, p 160-1.

[43] Margolis, J., & Fisher, A. (2002). *Unlocking the clubhouse: Women in computing.* MIT press. Kindle edition. The authors look at geek culture at Carnegie Mellon University and interventions to reduce the computer lab hacker aesthetics, to become more neutral and welcoming to others.

[44] These are just a few articles that look at hacker culture as a reason that women leave the profession. Gurer D. and Camp T. (1998*). Investigating the Incredible Shrinking Pipeline for Women in Computer Science- Final Report'*. National Science Foundation Project 9812016. Snyder, K. (2014b) Why women leave tech: It's the culture, not because 'math is hard'. *Fortune Magazine*. 02/10/14. Thomas, R. (2015) If you think women in tech is just a pipeline problem, you haven't been paying attention. *Medium.* 27/07/15.

The items listed in orange were identified by only one sex, and those in light green identify differences in order. Female students identified six additional stereotypes than male students: “unemotional”, “socially awkward”, “unathletic”, “reads professional publications”, “likes being in an organized environment” and “Seeks high revenue.” Only the male students identified “reads science fiction” as a computer programmer stereotype.

Men: N=117 for 80% : 14 items	Women: n=201 for 80% : 19 items
Practical	Practical
Conscientious	Conscientious
	Unemotional
Logical	Logical
	Socially awkward
Modelmaker/Artist	Modelmaker/Artists
Observer	Observer
Patient	Patient
Persevering	Persevering
	Unathletic
Hard worker	Hard worker
Reads science fiction	
Reads technical manuals	Reads technical manuals
	Reads professional publications
Wears glasses	Wears glasses
Strong math skills	Strong competency in technical domains
Strong competency in technical domains	Strong math skills
	Likes being in an organized environment
Enjoys learning new things constantly	Enjoys learning new things constantly
	Seeks high revenues

Fig. 2.5 Computer programmer stereotypes from questionnaires of first year French university science students (Collet 2005, p160-1)

As Collet noted, the positive vision of computer programmer is someone who attacks logical puzzles and solves problems. The negative vision is that of the antisocial hacker that programs all day. Certain characteristics of software production, notably working in

teams, were underestimated, which is an interesting echo of a quote by Yonatan Zunger in a high-profile rebuttal to the Googler's Manifesto of August 2017[45]:

> *"Once you've understood the system, and worked out what has to be built, do you retreat to a cave and start writing code? If you're a hobbyist, yes. If you're a professional, … then you'll quickly find that the large bulk of your job is about coordinating and cooperating with other groups. It's about making sure you're all building one system, instead of twenty different ones; about making sure that dependencies and risks are managed, about designing the right modularity boundaries that make it easy to continue to innovate in the future…*
>
> *Essentially, engineering is all about cooperation, collaboration, and empathy for both your colleagues and your customers. If someone told you that engineering was a field where you could get away with not dealing with people or feelings, then I'm very sorry to tell you that you have been lied to. Solitary work is something that only happens at the most junior levels, and even then it's only possible because someone senior to you — most likely your manager — has been putting in long hours to build up the social structures in your group that let you focus on code." (Zunger 2017)*

2.1.13 Women in Tech: Upper-Middle-Class Privilege

With two accomplished scientific parents, I came from an upper-middle-class background. Collet & Mosconi (2010)[46] found that French female engineering students usually came from higher social classes that provided them with a protective sense of singularity while in school, but this buffer disappears once they enter the professional world. The social class buffer against stereotype threat was a factor that caught me by surprise. Bias in American research often neglects social class by focusing instead on ethnic groups,

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[45] Zunger, Y. (2017) So, about this Googler's manifesto. *Medium*. The Googler's Manifesto was an ill-informed diatribe against inclusive practices at Google, arguing evolutionary psychology as a reason that women were not made to be engineers. It became a cause of the US far-right movements as examples of GAFA policies that stifle free speech when its author was fired.

[46] Collet, I., & Mosconi, N. (2010). Les informaticiennes: De la dominance de classe aux discriminations de sexe?. *Nouvelles questions féministes*, 29(2), 100-113.

perpetuating the egalitarian ideal that there is one social class in the U.S. On the other hand, French research bias is to see social class without its racial intersectionality.

French researchers are ethically not allowed to record a subject's ethnic group, which makes it difficult to examine racism or deal with intersectional issues pertaining to race. This was a particularly sensitive issue with my study of 9-11 year old children in Paris, which I will cover in the methodology section of Chapter 6. French universities will never ask you to define your ethnic group when you enroll, but they will ask you to define your parents' professions, a round-about way of determining which social class you belong to and benefit from.

2.1.14 Men in Tech: Upper-Middle-Class, Cisgender, Heterosexual, White Male Privilege

My partner's colleagues come from top engineering schools, and in the 5 years he has worked there, there has been only one female computer-programming intern in their department. She requested a position at the U.S. headquarters rather than stay in Paris when her internship was complete. When he and his colleagues interview the rare female candidates, they believe they are unbiased, but looking at the hiring pattern of his team, the manager favors 'good fit' under the guise of "previous professional experience" over academic qualifications. This means that someone who has been hired into a similar team will be favored over someone with higher academic credentials. All things being equal, 'good fit' is essentially someone just like them: white, male, heterosexual, who has been vouched for, preferably through a stint at another top U.S. computer company. A woman coming for an interview at their workplace is not starting from a level playing field, but rather one hindered by the manager's belief in his unbiased objectivity when hiring. He does not doubt his ability to identify a good candidate and does not consider himself

sexist; but his credibility for being unbiased is suspect when each encounter I have had with him involves supposedly ironic, yet inflammatory, sexist comments.

Other members of the development team must also interview candidates. This is where the “good fit” criteria really comes into play, because if managers must examine their bias through sensitivity training, the previous hires are under no obligation other than to ascertain technical competence and their desire to work with this person. My partner’s opinion was crucial in getting a “low-productivity, good-fit” candidate hired. Does this relative failure make my partner or his manager question their interview bias? Not really, because most candidates my partner had a hand in hiring have turned out to be productive. If my partner or his manager rejected a talented female candidate because he could not imagine reigning in his rambunctious humor, no one could prove this or hold him accountable.

My partner and his colleagues believe they are the product of a transparent meritocracy, and their high incomes and perks come from hard work and superior intellect rather than privilege. But looking at the least productive member of my partner’s team who was hired primarily due to ‘good fit’, my partner recognizes that in the hiring process he overestimated this candidate, primarily because the candidate had worked on a competitive product and for being relatively “senior” like himself. Thanks to being part of a GAFA multinational corporation, this average programmer regularly gets a salary raise even if his productivity is mediocre, and he will continue to benefit from having landed a position in a well known company when shopping his CV around for his next position.

Women (and other minorities) come into this domain with a distinct disadvantage of being an out-group[47] (DeAmicis & Carson 2014), and fitting in can be daunting.

The first phase of my research teases out resilient personality types of the women working in software development - compared to other populations - that withstand being an out-group, but these personality types are the minority. Having stumbled into software development, I hadn't until now analyzed my experience working in this field. I was exceptional in the way I entered the field as an autodidact; I was exceptional in my workplace by virtue of my sex. I wore those exceptions like a badge of courage, proud to have survived as long as I had, yet always feeling like an impostor.

[47] DeAmicis, C., & Carson, B. (2014). Eight Charts That Put Tech Companies' Diversity Stats into Perspective. Gigaom, August, 21. https://gigaom.com/2014/08/21/eight-charts-that-put-tech-companies-diversity-stats-into-perspective/

2.2 Definitions: Ordinary and Scientific

This section defines the terms used in this dissertation using both ordinary and scientific definitions for gender (2.2.1), design (2.2.2) and technology (2.2.3) domains. Its intensive use of lists is deliberate, to structure terminology and explain acronyms more clearly and compactly. Primary domain concepts and interdisciplinary issues will be explored in greater detail in subsequent sections.

2.2.1 Gender, Sex and Sexuality

After universal suffrage and the women's liberation movements of the late 1960s and 1970s, gender theories evolved from a separation of the social construction, representation and performance of masculinity and femininity from biological states of male and female reproductive anatomy, physiology, and genetics, and from sexual orientation, practices and preferences. Simone de Beauvoir (1949) said, "One is not born a woman but becomes one."[48] (p 13) Gender studies professor Michèle Riot-Sarcey has a succinct definition: "… gender aims to unveil the social construction of sex differences and seize the political dimension of the domination between men and women." (Riot-Sarcey 2016, p 26) Londa Scheibinger, Science History Professor at Penn State, gives a more complete definition:

> *"The term "gender" was introduced in the 1970s in an effort to check the then-rampant biological determinism, the point being to distinguish culturally specific forms of masculinity and femininity from biological "sex," construed as chromosomes, physiology, and anatomy. Biological determinists, then as now, grounded certain masculine traits, such as actute spatial relations, in male anatomy. The fashionability of the term "gender," however, resulted in its*

[48] de Beauvoir, S. (1949, 1989). "The Second Sex". Pg 13 *"On ne naît pas femme, on le devient."*

expropriation. Gender today is often used improperly as a PC code word for "sex," "woman," or "feminist." It is more properly used to refer to a system of signs and symbols denoting relations of power and hierarchy between the sexes. It can also refer to relations of power and modes of expression within same-sex relationships… "Sex," by contrast functions within gender studies to designate less malleable aspects of biology…" (Schiebinger 1999, p 14-7)

In this dissertation, we use the following definitions:

- **Sex** is a biological system reductively defined as a "male" and "female" dichotomy through hormones, physiology, and genetics. Sex is no longer the fixed dichotomy it once was thanks to scientific research on divergences in "3G" markers:
  - *Genetic*: chromosomal combinations such as XX (most common female), XY (most common male), X (Turner Syndrome), XXY (Klinefelter), XYY, XXXY…;
  - *Gonadal*: testes and ovaries reproductive glands; and
  - *Genital*: internal and external male and female reproductive organs.

  Anne Fausto-Sterling (1992, 1993 & 2000), Professor of Biology and Medicine at Brown University, debunks biological theories by revealing the complex world of intersexuality that results in chromosomal deviations and different combinations (or absence) of gonads and genitalia. Sex divergences occur with greater frequently than is often estimated; in as high as 2% of the population. Some adults only discover their intersex status late in life when they seek out infertility treatments. When deviations like genital ambiguity are noticeable at birth, children are often forced into one category or another through

"corrective" surgery and hormone therapy, though this practice is strongly discouraged by the United Nations Comission of Human Rights.[49]

- **Gender** is a social construction, e.g., the behaviors, traits, rights, dress, occupations, activities and emotions culture ascribe to males and females. The gender dichotomy categorizes them according to masculine and feminine values that are *oppositional* and whose inequalities are *natural*. Feminist researchers like Sandra Bem (1981, 1983) divides masculinity and femininity into separate ideologies that people adhere to as a whole or partially, in a mix and match fashion, as well as a gender-neutral androgynous category. Separating masculinity, femininity and androgyny also leaves the door open to other potential gender ideologies.

- **Sexual orientation** is one's sexual preference in a partner and is independent of one's sex or gender identity. Most contemporary cultures are hetero-normative; strong cultural pressures present heterosexuality as the only acceptable form of sexual orientation. (Butler 1990) Homophobic, anti-feminist, neo-conservative movements — like *Manif Pour Tous* and *Sens Commun* in France or the Alt-Right, Concerned Women for America, and Focus on the Family in the U.S. — often reductively equate gender fluidity with homosexuality, but the LGTBQIA and their heterosexual allies simply seek to

[49] Fausto-Sterling A. (1992). *Myths of Gender: Biological Theories about Women and Men, Revised*. Basic Books. Fausto-Sterling, A. (1993). The five sexes: Why male and female are not enough. *Sciences*, 33 (2), 20–24. 13. Fausto-Sterling A. (2000). *Sexing the Body: Gender Politics and the Construction of Sexuality*. Basic Books. New Ed Edition.

open up stifling social norms that reinforce the hegemony of straight, cisgender, white males.

2.2.1.1 Gender Stereotypes and Stereotype Threat

2.2.1.1.1 Social Groups and Stereotypes

A stereotype is a cliché, a culturally determined but oversimplified image or idea of a person through their belonging to a social group.

> *"A **social group** is a collective of persons differentiated from at least one other group by cultural forms, practices, or way of life. Members of a group have a specific affinity with one another because of their similar experience or way of life, which prompts them to associate with one another more than with those not identified with the group, or in a different way. Groups are an expression of social relations; a group exists only in relation to at least one other group. Group identification arises, that is, in the encounter and interaction between social collectivities that experience some differences in their way of life and forms of association, even if they also regard themselves as belonging to the same society."* (Young 2009, p 7)

2.2.1.1.2 Norms versus Stereotypes

- **Norms** are standards that one voluntarily adheres to, and social norms are informal understandings that govern expected behavior in society. Whether through imitation, immersion or coercion, one can desire or accept to conform to norms or reject them if the transgression carries relatively little cost.
- **Stereotypes** are social constructs (belief-habits) that are inculcated and imposed on members of a social group through a collective generalization or mental habit. (This will be covered in section 2.3.1.1) Depending on the context, umwelt, action or milieu, a person will call on stereotypes to facilitate signification and sense-

making, and these stereotypes can be more or less positive, neutral, or negative. This dissertation focuses on the impact of negative stereotypes that put pressure on members of disenfranchised groups in the form of stereotype threat and the imposter phenomenon. Negative stereotypes can lead to bias in sense-making with potentially negative repercussions in education, employment, housing, etc.

As we will see in Chapter 4, recognizing the difference between a norm (i.e., technology is a masculine pursuit) and a stereotype (i.e., men are better at math, and women are better at languages)[50] is something that can be confused if a person does not question authority. This propensity to question rules, norms and stereotypes is a key ingredient of the resilience to stereotype threat. While this is an important personality preference in creative and scientific fields (i.e. the iNtuition MBTI preference in which we will examine in Chapt. 4) that allows for a move beyond established knowledge and ways of thinking, the MBTI organization found this recalcitrant preference in only 26-34% of the general U.S. population and 25-30% of U.S. females.[51]

2.2.1.1.3 Negative Stereotypes

The negative stereotypes that concern women in ICT and STEM are:

- **Women and Math**: cultural belief in the inferiority of female math performance is pervasive yet statistically insignificant in the US. (Hyde 2014) Sex differences in

[50] Janet Hyde found statistically insignificant differences in math and language performance in her meta-analysis of sex-differentiation tests. Hyde, J. S. (2014). Gender similarities and differences. *Annual review of psychology*, 65, 373-398. Hyde, J. S., & Linn M. C. (1988). Gender differences in verbal ability: A meta-analysis. *Psychological Bulletin*, 104(1), 53. Hyde, J. S., & Linn, M. C. (2006). Gender similarities in mathematics and science. *Science*, 314(5799), 599-600.

[51] https://www.capt.org/mbti-assessment/estimated-frequencies.htm (retrieved May 15, 2018)

math results have been found to vary considerably in cultures that are more or less egalitarian. For example, girls surpass boys in Finland's highly egalitarian culture, but highly patriarchal cultures see sex differences in girls' math performance. (Hyde & Mertz 2009)[52]

- **Sex differences in cognition**: Cultural belief about women's hardwired incompatibility with engineering is often attributed to their lesser performance in spatial cognition. This overwrought topic will be covered in Key concepts > Gender Socialization of Sex Differences > Evolutionary Theories > Sex Differences and Cognition.
- **Women and Technology**: Technical competency is believed to be masculine attribute, and women's participation is simply as incompetent end-users for products (designed by men). As we will see later in Key Concepts > Feminist Technology, cultural belief valorizes masculine use and mastery of technology (like a lawn mower), while feminine use and mastery of technology (like a washing machine) is considered easy and degrading. Female technical professions like nursing or ICT production assembly are also chronically disregarded and underpaid.
- **Women and Science**: As discussed in the previous section (See "A Good Scientist is a Bad Woman"), Collet (2005 & 2006) found that the stereotype of scientists match the stereotypes of men: ambitious, competitive, logical, rational, audacious, distant, independent, and obsessed with objects to the detriment of relationships.

[52] Hyde, J. S., & Mertz, J. E. (2009). Gender, culture, and mathematics performance. *Proceedings of the National Academy of Sciences*, 106(22), 8801-8807.

Other stereotypes

- **Hackers and Gamers**: These two masculine stereotypes of highly-skilled, competitive computer programmers and video game players share certain commonalities: young males whose intense passion with technology leads to decreased social skills, fitness and bodily hygiene. Collet (2005 & 2006) found the hackers stereotype produced stereotype threat for French male first-year engineering students but not for French first-year females. Other researchers like Turkle (1984) and Breton (1990) have found this stereotype to negatively affect ICT's desirability as a workplace and women's expectancations for success.

2.2.1.1.3.1 Stereotype Threat and the Impostor Phenomenon

How do negative stereotypes affect people who belong to targeted social groups:

- **Salience**: The person needs to be cognizant of the stereotype's existence (stereotype internalization) and belonging to either an out-group or in-group. A negative stereotype can be made salient by activating recognition of one's out-group and in-group status, i.e. by filling out the race and gender field right before the SAT math test.
- **Out-group versus in-group status**: Stereotypes can be positive as well as negative. Members of groups with stereotypes of negative expectations (e.g. women and math) have out-group status and can experience stereotype threat. Members of social groups with stereotypes of positive expectations (e.g. Asians and math) have in-group status and benefit from stereotype boost or lift. People can belong to

multiple social groups (e.g. Asian women), but salience and self-identification will determine which stereotype will be activated. (Shih & Al. 1999)

- **Stereotype Threat**: Pressure to disconfirm a negative expectation of performance based on a person's out-group status. First used by Steele & Aronson in 1995 in the study of African Americans academic performance, the person fears his or her negative performance will be attributed to the negative stereotype rather than by individual performance or personal merit. A person needs salience and identification with his or her out-group (Bonnot & Croizet 2007b & 2011), as well as personal investment and concern in the performance of their abilities to succumb to stereotype threat. (Schmader 2002) Stereotype threat is believed to hinder a person's optimum performance through a combination of: anxiety, stress, efforts to suppress negative emotions, performance monitoring, narrowing of attention, (Schmader & Al 2008) and working memory interference (Bonnot & Croizet 2007a) (See Fig. 2.6 and 2.7). The strength of stereotype threat depends on how a task is framed, and salience can be activated by the mere presence of in-group members. Stereotype threat is one of the most researched topics in social psychology[53] and is not without its critics, often evolutionary psychologists who

[53] Steele, C., & Aronson J. (1995) Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology*, Vol. 69(5), Nov 1995, 797-811.
Schmader, T. (2002). Gender identification moderates stereotype threat effects on women's math performance. *Journal of Experimental Social Psychology, 38(2), 194-201.*
Schmader, T., Johns, M., & Forbes, C. (2008). An integrated process model of stereotype threat effects on performance. *Psychological review*, 115(2), 336.
Murphy MC., Steele CM. and Gross JJ. (2007). Signaling Threat: How Situational Cues Affect Women in Math, Science, and Engineering Settings. *Psychological Science*. October 2007, 18, 879-885.
Sekaquaptewa, D., & Thompson, M. (2003). Solo status, stereotype threat, and performance expectancies: Their effects on women's performance. *Journal of Experimental Social Psychology*, 39(1), 68-74.
Spencer S. J., Steele C. M., & Quinn D. M. (1999). Stereotype threat and women's math performance. *Journal of experimental social psychology*, 35(1), 4-28.
Bonnot, V. & Croizet, J.-C. (2007a). Stereotype internalization and women's math performance: The role of

cite methodological flaws, erroneous interpretations and publication bias.[54]

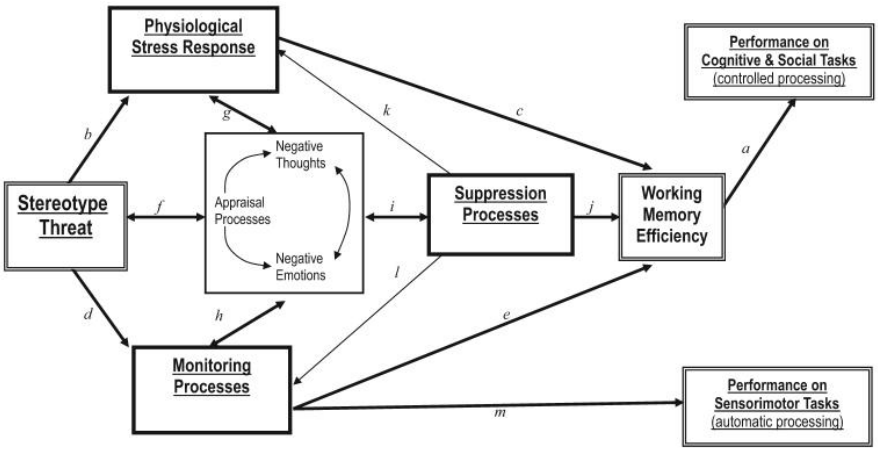

Figure 2.6 An integrated process model of stereotype threat effects on performance. © Schmader & Al. 2008

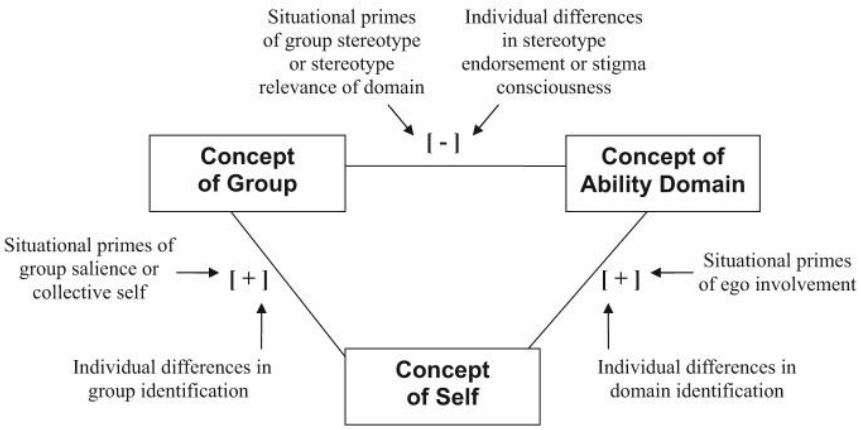

Figure 2.7 Stereotype threat as a cognitive imbalance triggered by person and/or situation factors © Schmader & Al. 2008[55]

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interference in working memory. *Journal of Experimental Social Psychology*, 43, 857-866.
Bonnot, V. & Croizet, J.-C. (2007b). Stereotype internalization, math perceptions and occupational choices of women with counter-stereotypical university majors. *Swiss Journal of Psychology*, 66(3), 169-178.
Bonnot, V., & Croizet, J.-C. (2011). Stereotype threat and stereotype endorsement: their joint influence on women's math performance. *Revue Internationale de Psychologie Sociale,* 24(2), 105- 120.
Bonnot, V., Neuville, E., & Rastoul-Migne, C. (2012). Stéréotypes d'incompétence: les conséquences professionnelles d'une menace sociale. N° spécial Inégalités sociales et orientation. *L'Orientation Scolaire et Professionnelle*, 41(1), 77-97.
Nguyen, H. H. D., & Ryan, A. M. (2008). Does stereotype threat affect test performance of minorities and women? A meta-analysis of experimental evidence. *Journal of Applied Psychology,* 93(6), 1314–1334.

[54] Stoet, G.; Geary, D. C. (2012). "Can stereotype threat explain the gender gap in mathematics performance and achievement?". *Review of General Psychology*. 16: 93–102. Note: Stereotype-threat researchers have the same criticism of the evolutionary psychology research from Stoet & Geary.

- **Stereotype Boost and Lift**: Stereotype boost is when a person's performance benefits from the salience of positive stereotypes, such as bringing up one's Asian heritage prior to taking a Math test. (Shih & Al. 1999) Stereotype lift is when a person's performance is improved through exposure to negative stereotypes of other social groups, like when white, Asian, or male students fill out the gender and race fields prior to taking the Math SAT.
- **Impostor Phenomenon**: Clance and Imes coined the term in their 1978 research paper: "The Impostor phenomenon in high achieving women: Dynamics and therapeutic intervention."[56]

> *"The term impostor phenomenon is used to designate an internal experience of intellectual phonies, which appears to be particularly prevalent and intense among a select sample of high achieving women. Certain early family dynamics and later introjection of societal sex-role stereotyping appear to contribute significantly to the development of the impostor phenomenon. Despite outstanding academic and professional accomplishments, women who experience the impostor phenomenon persists in believing that they are really not bright and have fooled anyone who thinks otherwise. Numerous achievements, which one might expect to provide ample objective evidence of superior intellectual functioning, do not appear to affect the impostor belief."* (Clance & Imes 1978, p 241)

We'll explore the foundations of the theory in the Key Concepts section later.

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[55] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2570773/

[56] Clance, P. R., & Imes, S. A. (1978). The Impostor phenomenon in high achieving women: Dynamics and therapeutic intervention. *Psychotherapy: Theory, Research & Practice*, 15(3), 241.

2.2.2 Design

Design conveys three ordinary meanings. The first concerns aesthetic: how something looks through artistic or skillful planning or production. The second concerns communication: the preparation of instructions for the production of manufactured goods. The third concerns problem solving: defining a plan or purpose. Donald Norman (2005) identified design's tripartite approach as appealing to our different emotions: a visceral response (through pleasure / repulsion from its appearance), behavioral response (through function and performance) and reflective response (through contemplation and meaning).[57]

Adrian Forty (1986) states that "the study of design… has suffered from a form of cultural lobotomy that has left design connected only to the eye and severed its connection to the brain and to the pocket. It is commonly assumed that design would somehow be soiled if it were associated too closely with commerce, a misconceived attempt at intellectual hygiene that has done no good at all." (p7) Forty stresses the link between design, commodification and capitalism, altering people's conception of progress and reducing their resistance to change. (p 11-41).[58]

Klaus Krippendorff (1989 & 2005) proposes this definition: "design is making sense of things."[59] The author proposes his product semantics theory as a systematic inquiry into how people attribute meaning to artifacts and interact with them accordingly. As a

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[57] Norman, D. (2005). *Emotional Design*. Basic Books.

[58] Forty, A. (1986) Objects of Desire: Design and Society Since 1750. Thames and Hudson.

[59] Krippendorff, K. (1989a). On the essential contexts of artifacts or on the proposition that design is making sense (of things). *Design Issues*, 5(2), 9-39.
Krippendorff, K. (2006). *The Semantic Turn, A New Foundation in Design*. CRC Press.

designer and engineer, he proposes a vocabulary and methodology for designing artifacts with consideration to the meaning they could acquire for their users and community of stakeholders.

Herbert Simon in *Science of the Artificial* (1968) has an even more inclusive definition of design: “Everyone designs who devises courses of action aimed at changing existing situations into preferred ones.” (p 111) Krippendorf issues this addendum to Simon’s statement: courses of action are only necessary if “design brings forth what would not come about naturally.” (Krippendorf 2005, p 25) Krippendorf identifies a trajectory of artificiality, of design problems moving towards sense-making and human-centeredness that builds upon the criteria brought forth from preceding categories (p 6):

1. **Products**: Utility, functionality, universal aesthetics.
2. **Goods, Services and Identities**: marketability, symbolic diversity, local aesthetics.
3. **Interfaces**: natural interactivity, understandability, reconfigurability/adaptability.
4. **Multiuser Networks**: informativeness, connectivity, accessibility.
5. **Projects**: social viability, directionality, commitment.
6. **Discourses**: generativity, rearticulability, solidarity.

He also proposes these 12 criteria that must be kept in mind when designing artifacts that are meaningful in use (Krippendorf, 2005, p 104-145):

1. **Human-centeredness** by employing user-centered design processes
2. **Meaningful interfaces** to move from recognition to exploration
3. **Second-order understanding** through understanding user’s conceptual models

4. **Affordances** through a user's perception and sense-making of an artifact influenced by conventions or social habits
5. **Constraints** through restrictive actions to prevent illegitimate uses or protect users
6. **Feedback** on any user action
7. **Coherence** through a system of visual metaphors, metonyms and icons that support comprehension
8. **Learnability** to allow users of any skill-level the ability to interface with an artifact
9. **Multi-sensory redundancy** to allow users with different abilities to interface with an artifact
10. **Variability-diversity** to match the diversity of its users
11. **Robustness** to recover from errors without disruption or causing harm
12. **Delegation of design competence** to the users

Krippendorff's inclusion of Discourses as a human-centered design activity and Simon's very open-ended, action-based design definition is my starting point for this dissertation. This position co-exists well with pragmatic semiotics, another theory of action, from the American philosopher, logician and scientists Charles Sanders Peirce (1839-1914), which will be explore later in this chapter.

2.2.2.1 Game Design

My dissertation focuses on video game's production and reception, not the video game artifact itself. My "course of action to change the existing situation to a preferred one" lies in the artifact's metabolism, i.e., the sum of metabolic activities taking place in a

particular environment linked in a circuit of interrelated stakeholders and habits as shown in figure 2.8 (Darras & Belkhamsa, 2016)[60].

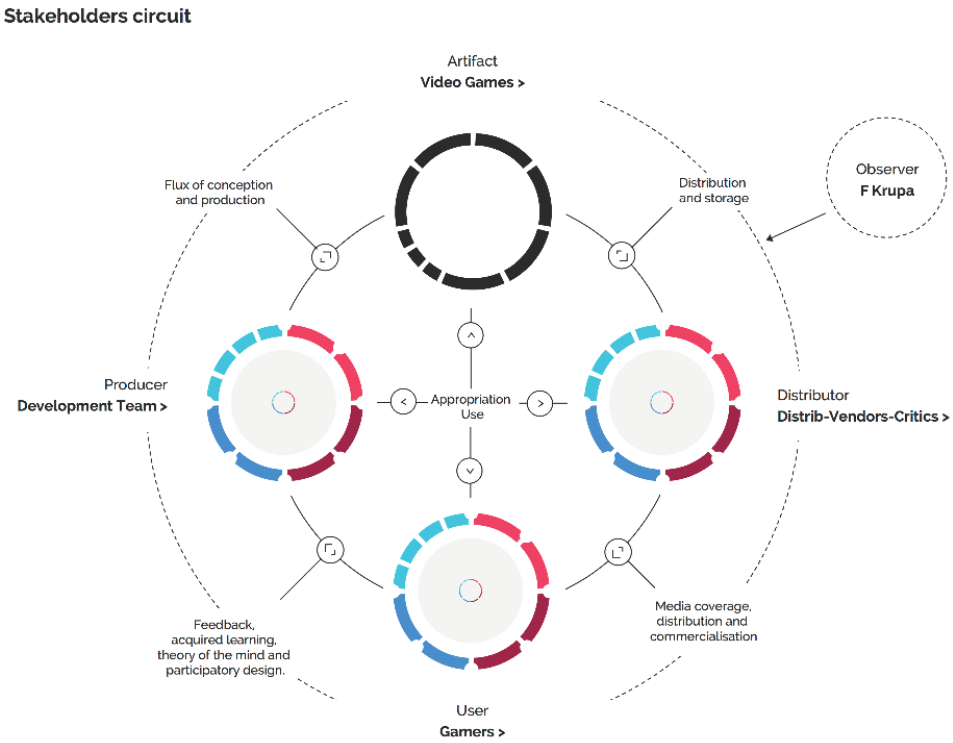

Figure 2.8 Metabolism of video games in a stakeholder circuit ©Darras & Belkhansa 2016

My objective is to increase women's participation in the production environment by studying children who play video games and the women who work in video game production, two domains where stereotypes play an important role in defining legitimacy, belonging and out-group status.

By focusing on video games, a mass-consumption artifact that is still gaining cultural legitimacy, I also examine game design as a design activity.

[60] http://metabolism.design

2.2.2.2 Definitions of Play and Games

Originally published in the Netherlands in 1938, Johan Huizinga's *Homo Ludens*[61] is credited as being the first sociological study of play and outlines the importance play and games as the primary formative element in human culture by educational transmission of rules and encouragement of social cohesion through fair play. Besides humans, most mammals use play to educate their young.

"Summing up the formal characteristics of play we might call it a free activity standing quite consciously outside of "ordinary" life as being "not serious," but at the same time absorbing the player intensely and utterly. It is an activity connected with no material interest, and no profit can be gained by it. It proceeds within its own proper boundaries of time and space according to fixed rules and in an orderly manner. It promotes the formation of social groups which tend to surround themselves with secrecy and to stress their difference from the common world by disguise and other means." (Huizinga, 1951, 34-35)

Huizinga initiated the concept of the "magic circle" inside of which the game takes place and where reality's rules are suspended. Other game theorists like Caillois, Henriot, and Salen & Zimmerman will repeatedly call upon this concept.

Roger Caillois's *Man, Play, Games* (1958 & 1967) build on Huizinga' s definition by creating a classification system that defines play activity as:

1. Free/Non-obligatory
2. Separate, occupying its own time and space
3. Uncertain, its outcome cannot be predicted beforehand and provides opportunity for multiple outcomes (except for puzzles)

[61] Huizinga J. (1951). *Homo ludens*. Essai sur la fonction sociale du jeu. Gallimard.

4. Unproductive, goods or wealth are not created, but possibly transferred
5. Governed by rules
6. Make-believe, standing apart from real life. (p 43-44) [62]

Caillois also defined the difference between play (*paidia*) and games (*ludus*) (p 27-8), as well as the human tendency to transform *paidia* into *ludus*: *paidia* is unstructured spontaneous playfulness, and *ludus* is structured activities with explicit rules.

Caillois's fundamental categories are the four play forms that provide players with intrinsic motivation and that can combine in multiple ways to create different cultural preferences:

1. *Agon*: Competition (e.g., team sports, chess, etc.)
2. *Alea*: Chance (e.g., dice, bingo, slots)
3. *Mimicry*: Role Playing (e.g., theatre, carnival, role-playing games, etc.)
4. *Ilinx*: Vertigo (e.g., rollercoasters, dancing, surfing, etc.)

Unlike Caillois, Jacques Henriot (1969 & 1989)[63] — whose untranslated, hard-to-find books remain relatively obscure outside of French game studies circles — focuses on "ludic attitudes" and defines games according to 3 levels:

1. What the player is playing: behaviors and system of rules
2. What the player is doing: operations

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[62] Caillois, R. (1958). *Les Jeux et Les Hommes: Le Masque et le Vertige*. Gallimard (Edition 1967), 43-44.

[63] Henriot, J. (1969). *Le jeu*. Presses universitaires de France. Henriot, J. (1989). *Sous couleur de jouer: la métaphore ludique*. J. Corti.

3. The game the player is playing: the player's ludic attitude that includes uncertainty, duplicity and illusion.

Henriot proceeds to analyze this ludic attitude in his chapter on the player's "poetry of action" that occurs in three rapid and successive stages:

1. First moment: magic (unreality): The game imposes itself upon the player to respect its structure and form.
2. Second moment: lucidity (reality): The player knows he/she is playing a game.
3. Third moment: illusion (surrealism): The player enters the "magic circle" at which point play can begin. (p 87)

2.2.2.3 Pragmatic Semiotics

Salens and Zimmerman (2004)[64] define design as the creation of meaningful experiences (p 47) and use C.S. Peirce's pragmatic semiotics[65] with its tripartite structure to define meaning through a sign's semiosis; a sign represents something other than itself.

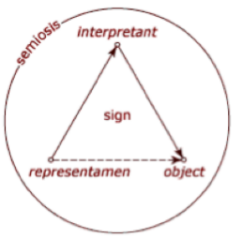

Figure 2.9 Micro Semiotics

Pragmatic semiotics is an appropriate design methodology since the purpose of semiosis is for sense-making that leads to meaningful action and habit-taking. Peirce believes that artifacts are the materialization of the Mind, of human consciousness.[66]

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[64] Salen, K., & Zimmerman, E. (2004). *Rules of Play. Game Design Fundamentals.* Cambridge, MA, MIT Press.

[65] Peirce C.S. (1998). *The Essential Peirce: Selected Philosophical Writings (2 Vols).* Indiana University Press. Peirce, C.S. (1974). *Collected papers of charles sanders peirce*. Harvard University Press.

On the micro level, semiosis occurs when the sign's representamen (the sign's state of being or what captures one's attention), and the sign's object (its aboutness) is mediated by using an intrepretant (i.e., schemas and stereotypes used to interpret the representamen). Context influences which quality of the phaneron (all that is known or visible but *subsconscious*) will attract attention to become the representamen and which interpretant will be called influencing the final determination of the object. This context sensitivity often results in different sense-making for different audiences. (Darras 2006)

Signs can mutate over time and exist on three simultaneous levels: micro, meso, and macro levels. (Darras 2011, 2015)[67]

- Micro Semiotics: a sign's tripartite internal components and its sub-typologies
- Meso Semiotics: semiosis in a sign or through a network of signs, which evolves from mutation to stabilisation
- Macro Semiotics: a semiosis network organized into systems of cultural beliefs and habits.

Pragmatic semiotic's triadic structures and levels reflect the complexity of sense-making. We'll explore pragmatic macro-semiotics and its relations to rules, norms, stereotypes and habits later in this chapter, but let's return to Salen & Zimmerman's structural approach to game design, which merits its inclusion in the Definitions portion of this chapter.

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[66] For Peirce, the Mind is the study of consciousness

[67] Darrass, B. (2006). *Images et Semiotiques: Semiotique Pragmatique et Cognitive*. Publications de La Sorbonne. Darrass, B. (2011). Design and Pragmatic Semiotics. *Collection #3 Art + Design/ Semiotics*. Paris College of Art, Summer 2011, 7-23. Darras, B. (2015) Epistemology of Pragmatic Semiotics master's seminar, Université Paris 1, Fall 1015.

2.2.2.4 Games as Designed Systems

For Salen & Zimmerman (2004)[68], games are systems that are composed of objects, attributes, internal relationships, and an environment that surrounds the system. The game's system can be framed in formal, experiential, and cultural terms that are embedded in and interact with each other. (p 55) Rules contain the formal game design systems, play contains the experiential game design systems, and culture contains the contextual game design systems. (p 105) Games provide meaningful play through four modes of interactivity that can occur simultaneously: cognitive interactivity (interpretative participation), functional interactivity (utilitarian participation), explicit interactivity (designed choices and procedures), and beyond-the-object Interactivity (cultural participation) (p 69). Meaning is derived from actions and outcomes in a series of stages used to construct a choice in the game.

Games are intrinsically artificial and correspond to Simon's definition of an engineered design activity. However, game rules are separate from a real-world context and have the following characteristics: rules constrain player actions, are explicit and unambiguous, shared by all players, fixed, binding and repeatable. (p 125) Game rules exist on three levels:

1. Implicit rules: etiquette and commonsense rules that may become explicit when written in the operational rules, such as in games for young children
2. Operational rules: rules of play usually found in printed instruction booklets in how to manipulate the game's objects and interpret results

[68] Ibid, p 55-139

3. Constitutive rules: abstract mathematical rules that define the game's core logic. (p139)

2.2.2.5 Video Game Categories

Once we've defined games as systems of rules, we can begin to talk about categorization beyond Caillois's four fundamental play categories applied specifically to video games. We could use video game super genres, used by the 2017 Entertainment Software Association final report[69], which finally combined console video games and computer games in their statistics after keeping them in separate categories for the previous ten years.

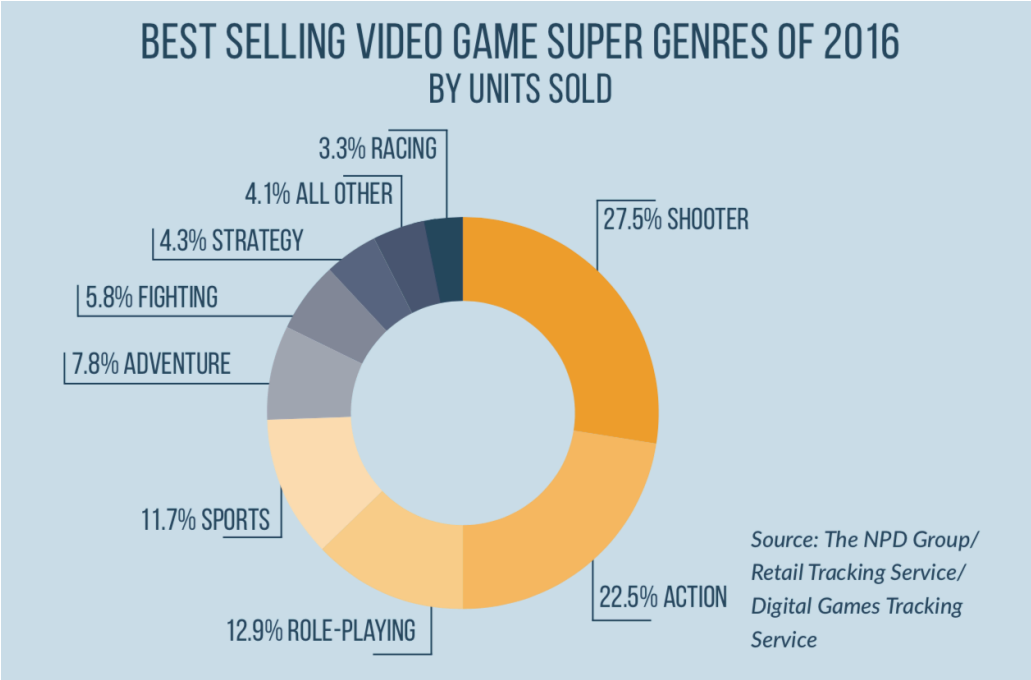

Figure 2.10 ESA 2017 Final report, Best Selling Video Game Super Genres, p 12 © ESA

[69] Entertainment Software Association (ESA) (2017). Essential Facts about the Computer and Video Game Industry. http://www.theesa.com/wp-content/uploads/2017/04/EF2017_FinalDigital.pdf (retrieved 18/04/18)

Pinning down video game genres is an arduous task because distinctions between categories like action versus adventure games are shifting and debatable. Instead of focusing on content to classify video games, meta-categories of gameplay defined by Le Diberder & Le Diberder (1998, p 43-78) allows hybridization between them while remaining distinctive and easily understandable:[70]

1. **Reflection games**: strategy, classic puzzle and card games, role playing, adventure…
2. **Simulation games**: sports, driving, military strategy, complex systems, god games, sandbox games…
3. **Action games**: shooters, arcade and platform games, combat, sports…

[70] Le Diberder, A., & Le Diberder, F. (1998). *L'univers des jeux vidéo*. Paris : La Découverte.

2.2.3 Technology

Game design may be a subset of design; however, video games fall squarely within the realm of technology with their digitized content and screen-based manifestations. Before we can dive into the heart of the matter, we must first step back to define technology and its many acronyms that will be used in this dissertation.

Technology is defined as: the application of scientific knowledge for practical purposes, especially in industry; machinery and devises developed from scientific knowledge; the branch of knowledge dealing with engineering or applied sciences; technical terminology; and the sum of the ways in which social groups provide themselves with the material objects of their civilization.[71]

Marxist criticism of technology as an element of class struggle begins in the mid-19th century. Technology and feminist theory always had a tenuous, difficult relationship that begins earnestly in the late 1970 and 1980s with the work of researchers who specialize in feminist technology studies: Paola Tabet, Cynthia Cockburn, and Judy Wajcman. Isabelle Collet (2005 & 2006) links the masculinization of computer science to sexist technological myths. Their key concepts are explored in the Primary concepts section (section 2.3.3) of this chapter.

2.2.3.1 Terminology and Acronyms

- **STEM** (Science, Technology, Engineering and Math): The last male-dominated bastions of higher education. Finding STEM applicants is considered an economic

[71] http://collinsdictionary.com

priority because too few college students are entering these fields to meet the demands of ICT companies. (See Fig. 2.2)

- **ICT** (Information and Communication Technology): An umbrella term for a diverse set of hardware, software, tools, and resources used to communicate, disseminate, store and manage information. Someone who works in ICT can be in the hardware, software, networking, broadcasting and telecommunications sectors.
- **IT** (Information Technology): Considered a subset of ICT, IT is often more closely aligned with computer science. ICT is the preferred acronym for this dissertation.

Video Game Terminology

- **Salon/home consoles**: salon or home consoles are video game consoles meant to be hooked up to the television for the primary purpose of playing video games. Although Atari and Sega once lead the industry, Nintendo (Wii and WiiU), Sony (PS4), and Microsoft (Xbox 360 and Xbox One) produce the salon consoles that currently dominate the market. Nintendo's latest release, the Switch is playable as both a two-gamepad salon console or as a handheld console. Manufacturers of video game consoles stringently control which video game are authorized for release. Console video games are produced by development teams that may be partners (often co-owned by the manufacturer), in-house, or independent developers and publishers. (See Fig. 3.3 Dominant video game consoles 1977-2017 for more details.)
- **Hand-held consoles**, also known as personal consoles, are hand-held hardware with screens that play video games. Major console manufacturers listed above

control the bulk of the market but cellular phone manufacturers like Nokia, Samsung and Apple have encroached on this turf with touchscreen smart phones. Unlike salon consoles, hand-held consoles are more likely to be personally-owned rather than shared in a household.

- **PC and computer games**: PC is an acronym for personal computer, and video games made for a computer is referred to as a computer game. The Entertainment Software Association (ESA), the U.S.'s game publisher association, continues to separate computer games from video games in its statistics.[72] The advent of touchscreen tablets and smartphones further blur the boundaries between computers, handheld consoles and phones. For this dissertation the term computer game is abandoned in favor of the more flexible and all-encompassing term video game. PC and computer games fall into the acceptable gameplay category of hardcore gamers yet are distinguished from games that are free-to-play browser-based internet games.
- **Video game** - For this dissertation, video games are any games that contain digital content regardless of the hardware and user-feedback device that is viewed on any type of screen: television sets, computer monitor, projection system, handheld device, touchscreen device or head-mounted display.[73] The digital content can be specific to a device (i.e., the original *Pong* console), purchased in a store, downloaded to a device or streamed. Video game interactivity can be through

[72] Entertainment Software Association (ESA) (2016). *Essential Facts about the Computer and Video Game Industry*. http://www.theesa.com/wp-content/uploads/2016/04/Essential-Facts-2016.pdf

[73] Note: ESA identifies video games as games created for consoles rather than PCs (which are computer games.)

keyboards, gamepads, touchscreens, motion-tracking devices (i.e., Kinect or Moove), or specialized hardware (i.e., microphones, joysticks music instruments, platforms, etc.).

- **Gamer capital**: Can be understood through Bourdieu's notion of cultural capital (1973)[74] that forms the foundation of social life through symbolic elements like skills, tastes, behaviors, mannerisms, fashion, language, and credentials acquired by being part of a social class. Capital is itself a notion inherited from Marx to determine one's standing in society, but Bourdieu extends capital's reach to the symbolic realm. Mia Consalvo (2007)[75] extends the notion to gamer subculture by looking at gamer capital that hardcore gamers acquire through significant time and effort in the practice and competition of certain types of games (AAA titles) played on computer or salon consoles; by reading certain video game magazines (like *Nintendo Power* (2007-2012), *Electronic Gaming Monthly* (1988-2009), or the French bi-monthly *The Game* (2014-present); and following certain blogs, Twitch, and YouTube channels. These activities, in turn, define the gamer subculture, and more importantly, defines what is *not* part of gamer culture: the illegitimate gaming practices of outsiders (women, minorities and children) such as casual and pink games, as well as playing on easy-to-use consoles with a low threshold of

[74] Bourdieu, P. (1973). *Cultural reproduction and social reproduction*. Tavistock, 178.

[75] Consalvo, M. (2007). Cheating: Gaining advantage in videogames. Mit Press.

gameplay and interactivity like most hand-held consoles, the Wii and WiiU[76], and touchscreen devices like the iPhone and iPad. (Harvey 2015, p 132-134)[77]

[76] Ingham, T. (2010, Jan. 6) Capcom: Hardcore gamers have disowned Wii. http://www.computerandvideogames.com/article.php?id=230815 (Accessed 1 September 2010).

[77] Harvey, A. (2015). *Gender, Age, and Digital Games in the Domestic Context* (Vol. 3). Routledge.

2.3 Primary Domain Concepts and Keywords

Section 2.3 defines the perimeter of my research subject beginning with gender ideologies (2.3.1) and gender socialization theories (2.3.2). Subsequent sections look at how gender influences or intervene in feminist technology studies (2.3.3) through the research of McIntosh (2.3.3.1), Tabet (2.3.3.2) and Cockburn (2.3.3.3) and in gendered design (2.3.4) through the masculinization of ICT through its artefacts (2.3.4.1), the girl games movement in the 1990s (2.3.4.2), the effects of gender stereotypes on software designers (2.3.4.3), and the design heuristics of girl games entrepreneur and design research specialist Brenda Laurel (2004) (2.3.4.4-5).

2.3.1 Gender's Function and Purpose

Gender is a social construct that operates on multiple levels starting with ideologies defined and maintained by society, reinforced by social interaction, and internalized by an individual who then appropriates - or ignores - these prescriptions. (Crawford & Unger, 1993; Schiebinger, 1999, p 16-7; Bereni & Al. 2012, p 109-67) [78]

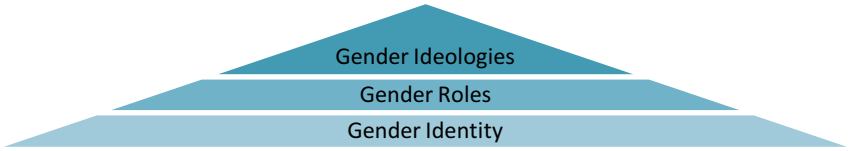

Figure 2.11 Gender's social construction from society to the individual through social interaction

[78] Unger, R. K., & Crawford M. (1993). Commentary: Sex and gender: The troubled relationship between terms and concepts. *Psychological Science*, 4(2), 122-124.
Schiebinger, L. (1999). *Has feminism changed science?* Harvard University Press.
Bereni, L., Chauvin, S., Revillard, A., & Jaunait, A. (2012). *Introduction aux études sur le genre* (Vol. 2). De Boeck Université.

2.3.1.1 Gender Ideologies, Schemas and Stereotypes: culturally specific prescriptions of acceptable traits for men and women, which vary by age, religion, class, nationality, ethnicity, etc.

A schema is a way or organizing and framing knowledge that can integrate new information, embed other schemas inside themselves, and represent knowledge at different levels of abstraction (Salen & Zimmerman 2004, p 105).[79] Gender schemas are socially constructed mental shortcuts, or *belief/habits* in pragmatic semiotics, that are transmitted and internalized through a social conditioning process called gender socialization.

The following passage describes the three processes that are involved in the repeated validation and reconfirmation of gender ideologies:

> *"The first process, the tendency to generalize from physical cues to cognitive and personality traits, leads us to see the innumerable small but consistent behavioral differences between men and women as confirmation that men and women are different. The second process is our tendency to translate extreme values into evidence of typicality. We see a few hyperstereotypic examples, and they lead us to distort the average tendency. The third process, our tendency to view the sexes dichotomously, makes us more sensitive to traits that are consistent with a given gender role and less sensitive to inconsistent traits."* (Valian 1999, p 120)

Gender schemas serve a number of functions meant to lighten the cognitive workload by calling these ready-to-use constructs in rapid decision-making processes.[80] (Kahneman 2011) Gender schemas and stereotypes give rise to expectations; help interpret

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[79] Salen, K., & Zimmerman, E. (2004). *Rules of Play. Game Design Fundamentals*. Cambridge, MA, MIT Press.

[80] Kahneman, D. (2011). Thinking, fast and slow. Macmillan. Schemas and stereotypes are part of System 1, which comprises over 90% of our mental processes that require fast lazy automatic thinking.

consistent behavior; supply explanations where data may be missing or ambiguous; help direct the search for new information in case of doubt or crisis; and provide ways of handling exceptions through subtyping.[81] (Valian 1999, p 106)

Besides optimizing thinking processes, gender schemas and stereotypes guide individuals in how to act, be and feel according to socially-defined belief-habits within a masculine-feminine *gender dichotomy*. Gender socialization is reinforced through interactions with family, peers, society and artifacts and maintains a hierarchy that generally favors masculine domination.

2.3.1.1.1 Pragmatic Semiotics and Gender Beliefs

Pragmatic semiotics is a theory of action, so schemas and stereotypes stabilize and reinforce belief/habits - that which one does not doubt - and encourages habit-taking. Habits are in the service of deliberation, making resolutions to act, and taking action. We can examine this theory further.

[81] Valian, V. (1999). Why so slow?: The advancement of women. MIT press.

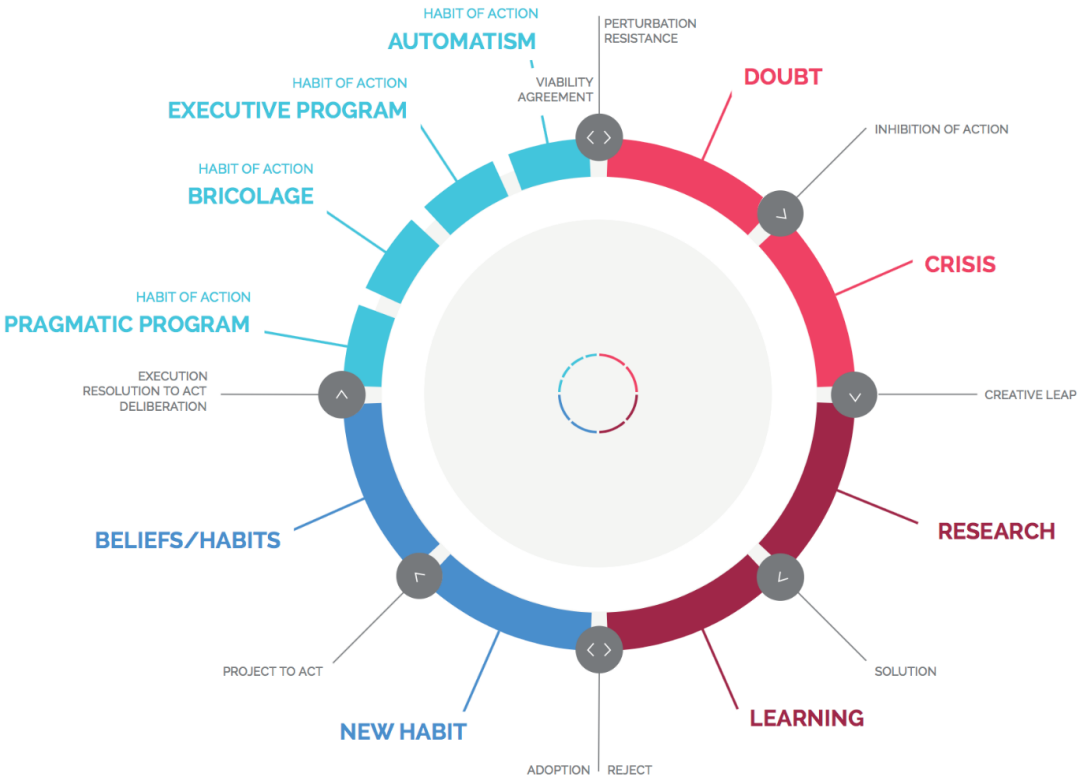

Figure.2.12 Metabolic cycle of habit taking © B. Darras & S. Belkhamsa 2016 (http://metabolisme.design)

If we follow the metabolic cycle of the habit-taking (Fig. 2.12) by Darras and Belkhamsa (2016), gender stereotypes are established **beliefs** – that which one does not doubt - and is called upon when action is required. For example, when a manager needs to make a hiring decision like: “Will this female with a PhD research background be able to integrate our product development team, or should I hire the programmer with a BS in Computer Science that spent time at a competing company?” The decision-maker will not realize that he/she will call on gender and hacker stereotypes to facilitate their choice of which candidates to interview, and that the decision will most likely favor the candidate whose path most resembles either the decision-maker’s or will rely on the manager’s vetting process and previous successful hiring decisions.

In pragmatic semiotic's metabolic cycle,[82] the four habits of action are:

- **Pragmatic program:** the first step of the execution cycle where a plan of action calls either internal representations (e.g. multiplication table) or external representations (e.g. recipes).
- **Bricolage:** creative action phase of trial-and-error guided by habit and semiosis of use of the physical world, when the pragmatic program meets real-world complexity on its way to hopefully becoming an executive program.
- **Executive program**: bricolage that has been optimized and successfully repeated numerous times to become a stable action habit.
- **Automatism**: an executive program repeated to the point that its procedural efficiency no longer burdens the subject, (e.g. riding a bike, walking down stairs, driving a car, etc.) freeing them to concentrate on other things.

If the manager's previous hire (for culture fit) was a severe disappointment, this may create **doubt** in his or her executive decision-making process. Failure can invalidate a belief or habit, leading to an inhibition of action and creating an obstructive **crisis** situation in the absence of viable solutions. This uncomfortable phase spurs the **research** for new solutions that take place either through speculative, mental exploration or invention of concrete solutions.

Once a solution is identified, **Learning** a new solution to transform it into a habit in a person's belief system can be a complex and lengthy procedure. "When a new habit is

[82] http://v2.metabolisme.design/home/index (Darras & Belkhamsa 2016)

validated by the agent's interpretive community (e.g. ICT managers, hardcore gamers, etc.) and is widely shared, it becomes habitus." (Darras & Belkhasma 2006)[83]

A new solution can be adopted or rejected, but validation by the interpretive community is important for its transition into a **New Habit** status by integrating itself into a cultural network of existing habits and beliefs. This is established through practice and through social recognition. A new habit can once again become a **belief/habit** once this has become a general guide or rule applied to action that follows a person's deliberation.

> *"Belief consists mainly in being deliberately prepared to adopt the formula believed in as the guide to action." (Peirce 1903, CP 5.27-28)*

What becomes abundantly clear is that a phase of **Doubt** and **Crisis** is required to put stable, stereotypic beliefs and habits into question. The #MeToo movement to end sexual harrasment endemic in Hollywood (that has since spread to abuse of power in politics and other industries) or the #1reasonwhy movement to expose game industry sexism are an excellent example of digital-age feminist movements that set up **Doubt** and **Crisis** situations in their respective industries.

2.3.1.2 Gender Ascriptions or Roles: behaviors expected of an individual because of implicit membership to either the male or female category.

Gender roles tend to be stereotypical and reductive. If we examine the stereotypes of the bread-winning father and stay-at-home mom, these gender roles may be outdated, but

[83] http://v2.metabolisme.design/diagnostic/user/learning

they form long-lasting patterns or habits of thought that have deleterious consequences for working mothers. Current labor statistics in the United States for 2017 are:

- Almost 47 percent of U.S. workers are women.[84]
- Seventy percent of mothers with children under 18 participate in the labor force, with over 75 percent employed full-time.[85]
- Mothers are the primary or sole earners for 40 percent of households with children under 18 today, compared with 11 percent in 1960.[86]

Antiquated gender roles lead to real-world repercussions when they create unconscious bias. For example, a manager that puts a pregnant woman or recent mother on "mommy-track," assuming she will *prefer* to stay home with the child and will be absent more often if the child is sick. Managers through mere suspicion of future absenteeism may harbor bias against recent mothers and women in their childbearing years. A future or recent father experiences no such decrease in responsibility, often quite the opposite. A child is not seen as a burden on the father's availability and reliability, only on the mother's. A recent father benefits from his new role as responsible "bread-winner" and may see increased professional responsibility and faster promotions. Management may not realize that they are using implicit, biased gender roles from the 1960s to evaluate their employees, but stunted mommy-track career-progression is a fixture of academia and

[84] https://www.bls.gov/news.release/empsit.t01.htm

[85] https://www.dol.gov/wb/resources/WB_WorkingMothers_508_FinalJune13.pdf, p 2.

[86] https://www.dol.gov/wb/resources/WB_WorkingMothers_508_FinalJune13.pdf, p 5.

STEM workplaces, even if mothers do not take extended time off for child-rearing.[87] (Valian 1999, Schiebinger 1999, Monosson 2008)

Regardless of the parents' commitment to equality in parenting or professional roles, some mothers will prefer to stay home, some will be forced to stay home due to unaffordable childcare, and others will prefer to return to the more intellectually stimulating workplace, regardless of cost. Assuming a mother automatically wants to stay at home with her child makes mothers in the last two categories feel guilty about being "bad mothers" — selfish creatures who are incapable of being fulfilled with infant care-taking.

If we examine the nurturing, maternal gender role further we can link back to the manager's expectation of a mother's increased absenteeism. When a child is sick at school, the first parent called is usually the mother, since gender roles ascribe her career as secondary in importance to her husband's career (assuming she has a partner). The school assumes the mother has greater availability, interest and detailed knowledge of her children than the father. While school administrators may not think they are biased when making the decision about which parent to call when the child is sick — they may claim that mothers are often able to pick up sick children more frequently than fathers — calling the mother first creates a self-fulfilling prophecy by coercing the mother to leave work to pick up her children. After all, maternal gender roles encourage and laud a mother's self-sacrifice and attention to others. It begs the question: what heartless

[87] Schiebinger, L. (1999). Has feminism changed science? Harvard University Press. Valian, V. (1999). Why so slow?: The advancement of women. MIT press. Monosson, E. (Ed.). (2008). Motherhood, the elephant in the laboratory: Women scientists speak out. Cornell University Press.

mother would leave her child sick at school or ask the father to go pick up his progeny? Her repeated absence for childcare reinforces the gender schema of working mother's unreliability/unavailability and simultaneously reinforces her manager's justification for putting her on "mommy-track". The father is never made to feel inadequate nor gives rise to a conflicting role as parent and professional. The professionally-invested mother is caught is a Catch-22 of being a bad mother or unreliable colleague. This bind is a frequent explanation given by women in their 30s for leaving competitive STEM professions like game and software development with significant time demands. As a result, they place themselves on a mommy-track by choosing less demanding jobs or roles, thus slowing their career progression.

Delving further into the nurturing mother and disciplinarian father stereotypes we can observe that such stereotypes also create other significant bias in professional settings for women. The pressure to submit to those stereotypes creates a bind for agentic women who are negatively evaluated if they are not seen as socially-minded or accommodating enough. Socially insensitive, domineering male professionals are not burdened by expectations of social awareness and sensitivity and are able to progress without the obligation of likeability. (Hyde 2005, p 590)

2.3.1.3 Gender Identity*: how individuals appropriate aspects of gender ideologies, schemas and stereotypes as part of their sense of self, which can change according to context.*

Motherhood had a negative effect on my career progression. Regardless of my and my partner's willingness to share parental responsibility, gender role expectations were imposed on us. Bias from parental gender stereotypes, such as those listed above, were

inflicted disproportionately on me rather than my partner by our respective workplaces, schools, and administrations.

I personally and repeatedly experienced every conflict described in the gender ideologies and roles section. For example, I systematically placed my partner as principal contact on *every* school form, including for the medical information sheet, but I remain the first parent called if a child is ill whereas my partner receives the absence and lateness notices, reinforcing the stereotype of disciplinarian fathers.

Career-wise, 20 years ago we had identical salaries; he now earns four times my salary. My managers assumed I would want to be home with my children, so regardless of my desire for career advancement, my responsibilities were reduced by being less-frequently assigned to lead new project. My partner would have liked to reduce his hours to spend more time with our children, but he was hemmed in by the expectations of a fulltime position with "golden handcuffs," crunch periods, and extended international travel. As my partner's career continued to progress, I reduced my hours to compensate his lack of availability at home, feeling obligated to make sure the children were taken care of.

Caught between coercive professional and social pressures, I know I am not alone in experiencing and resenting parenthood's negative impact on women's careers, while it is positive or neutral to men's careers.

2.3.2 Gender Socialization of Sex Differences

Sex-differentiation often begins before birth with the ultrasound and other prenatal tests. Parents are usually told that the child is a boy or a girl, and preparation can begin in name choices, room decorations, and/or clothing/toy purchases. By the time a child is born, it lands in a gendered milieu full of parental expectations. Studies have shown that parents have gendered interactions with young children, which includes eye contact, smiling, speaking, physical interaction, physical distance, feedback, responding to crying, and promoting independence. (Honig 1983)[88]

Sex-differentiation is acquired by children through observation and internalized through repeat sex-differentiated performance, activities or actions (e.g. toys, games, clothing, food, media, adult interactions, etc.) that allow gender ideologies to be gradually incorporated as children learn to identify and stabilize their own sex category, called gender constancy[89], around the ages of three to five. (Frey & Ruble 1992) Conforming to gender ideologies progressively becomes more important as children reach the age of the seven and then becomes more flexible when they reach around ten years old. (Martin & Ruble 2002 & 2004)[90]

There are several the major theories that try to explain to gender differences:

- Evolutionary theories

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[88] Honig, A. S. (1983). Sex role socialization in early childhood. *Young Children*, 38(6), 57-70.

[89] Frey K. S., & Ruble D. N. (1992). Gender constancy and the cost of sex-typed behavior: A test of the conflict hypothesis. *Developmental Psychology*, 28(4), 714.

[90] Martin, C. L., Ruble D. N., & Szkrybalo J. (2002). Cognitive Theories of Early Gender Development. *Psychological Bulletin*, 128(6), 903-933. Martin, C.L., & Ruble D. (2004). Children's Search for Gender Cues. *Current Directions in Psychological Science*, 13(2), 67-70.

- Cognitive Social Learning Theory
- Sociocultural Theory
- Expectancy Value Theory
- Theories of Gender Similarity

2.3.2.1 Evolutionary Theories

Janet Hyde's (2014) description of evolutionary theories is ideal. While she inherently disagrees with this theory, she manages to strike a distant, respectful, almost neutral tone:

> *"Evolutionary psychology has focused on how psychological gender differences are the product of evolutionary selection, based on an assumption that different behaviors are adaptive for males compared with females (e.g., Buss & Schmitt 1993). Two concepts are key to the argument: sexual selection and parental investment. Originally proposed by Darwin, sexual selection, which is distinct from natural selection, consists of two processes: (a) Members of one gender (usually males) compete among themselves to gain mating privileges with members of the other gender (usually females), and (b) members of the other gender (usually females) have preferences for and exercise choice in mating with certain members of the first gender (usually males). Sexual selection can be invoked, for example, to explain gender differences in aggression…. Gender enters the picture because human females generally have substantially greater parental investment in their offspring than do human males. Women invest a precious egg (compared with the millions of sperm that men can produce every day) and then invest nine months of gestation, which is costly to the body. At birth, then, women have greater parental investment than men do, and it is to the advantage of the person with the greater investment to care for the offspring, making sure that they survive to adulthood. Herein lies the evolutionary explanation for women's greater involvement in child care, which in turn may have enormous repercussions in other domains, such as the explanation for the dearth of women in certain science, technology, engineering, and mathematics (STEM) disciplines."* (Hyde, 2014 p4)[91]

[91] Hyde, J. S. (2014). Gender similarities and differences. *Annual review of psychology*, 65, 373-398.

In *Testosterone Rex*, Cordelia Fine (2017) breaks down the myth of the uninvested promiscuous male and his "cheap and easy" sperm through statistical analysis. In her calculations, a stable family man could reasonably father around 12-16 children in the absence of contraception in his lifetime, while a single man who would have to exert time and energy to woo an available, willing, hopefully *ovulating* and *fertile* female who wasn't already pregnant in his milieu. "A promiscuous man would need to have sex with more than 130 women just to have a 90% odds of outdoing the one baby a monogamous man might expect to father in a year." (Fine, 2017 loc 601)

Fine deconstructs not only the male's miniscule chances of reproductive success from a single copulation, but also his supposed desire for a large number of partners. After all, human sexuality is not just for reproductive purposes; procreation represents a tiny portion of a person's sexual activity. Studies in sexual behavior show a tendency towards *gender similarities* once the tendency of men's sexual overstatement and women's sexual understatement has been adjusted, i.e., research subjects tend to adjust their answers to align with gender expectancies of male promiscuity and female virtuousness by rounding up or down their number of partners. The NATSAL Survey[92] found 80% of men and 89% of women preferred to be in sexually exclusive relationships. In the oldest age bracket (35-44), 86% of men and 92% of women preferred sexual exclusivity. It would seem evolutionary theory's promiscuous male is the exception rather than the norm, and hypothetical scenarios that exploit these myths are based on faulty basal assumptions.[93]

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[92] http://www.natsal.ac.uk/media/2086/reference_tables.pdf Table 8.1

[93] Fine, C. (2017). *Testosterone Rex: Myths of Sex, Science and Society*. WW Norton & Company. Chapter 2. The book also explores the role of testosterone as a complex hormone that creates gender similarities in behavior.

> *"The old assumption that sexual selection has created near-universal sex roles—males mostly like this, females mostly like that—has been replaced with growing recognition of the diversity of courtship and parental roles both across and within species." (Fine 2017, loc. 777)*

Fine also addresses the gross oversimplification of the role of hormones that evolutionary psychologists use to justify forms of sexual domination, in particular their supposed role in creating "male" and "female brains."[94] (Kimura 1992 & 2000, Moir & Jessel 1991) Feminist researchers like Fine (2010 & 2017), Halpern (2001, 2013), and Vidal (2012) discredit brain sex theory by pointing out that there is as great a variation between members of the same sex as overall variation between the two primary sexes, and that results that identified "gendered" brain regions vary according to the subjects being tested.[95] In other words, testing two different groups of 10 men and 10 women identified different "gendered" regions of the brain for each test. More importantly, sex differences in the brain may have little consequence for behavior; different brain structures may reach the same results via different neural means. (Fine 2017 Chpt 4, loc 1248).

> *"Sex isn't a biological dictator that sends gonadal hormones hurtling through the brain, uniformly masculinizing male brains, monotonously feminizing female brains. Sexual differentiation of the brain turns out to be an untidily interactive process, in which multiple factors—genetic, hormonal, environmental, and epigenetic (that is, stable changes in the "turning on and off" of genes)—all act and interact to affect how sex shapes the entire brain. And just to make things even more complicated, in different parts of the brain, these various factors interact and influence one another in different ways." (Fine 2017 loc 1167)*

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[94] Kimura, D. (1992). Sex differences in the brain. *Scientific American*, 267(3), 118-125. Kimura, D. (2000). *Sex and cognition*. MIT press. Moir A., & Jessel D. (1991). *Brain Sex: The Real Difference between Men and Women*. Lyle Stuart Book. Geary, D. C. (1998). *Male, female: The evolution of human sex differences*. American Psychological Association.

[95].

Brain plasticity is a critical factor. Infants must learn different languages at birth and adapt to radically different social and environmental contexts. This suggests that adaptive brain capabilities are key to long term survival, and that adaptive social skills – cooperation, communication, attention to others, etc. - are as important to human evolution and long-term survival as sex selection. (Pagel 2006, 2012 a &b)[96] In other words, biological factors are co-determined by social factors.

2.3.2.1.1 Sex Differences and Cognition

> *"Feminist scholars have long recognized the cloak of legitimacy that science drapes over the status quo… The alleged scientific discovery that particular areas of women's and men's brains are 'hardwired' differently serves to reify and consolidate the belief in women's natural limitations in scientific competence."* (Nash & Grossi 2007, 2-3,)

Cognitive sex differences is still a dominant subject for biological determinist researchers like Moir & Jessel (1992), Geary (1998), and Kimura (1992, 2000) and feminist researchers who counter them like Maccoby & Jacklin (1974); Caplan, Crawford, Hyde & Richardson (1997); Nash & Grossi (2007), and Halpern (2013).[97]

Sex differences in cognitive tests such as the 3D mental rotation are often brought up to justify women's lack of enthusiasm or natural skill or inclination for computer science. While some researchers believe these cognitive differences are hardwired by our

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[96] Pagel, M. (2006). Darwinian cultural evolution rivals genetic evolution. *Behavioral and Brain Sciences*, 29(4), 360-360. Pagel, M. (2012a). Evolution: adapted to culture. *Nature,* 482(7385), 297-299. Pagel, M. (2012b). *Wired for culture: origins of the human social mind.* WW Norton & Company.

[97] See footnote 5; Maccoby E. E., & Jacklin C. N. (Eds.). (1974). *The psychology of sex differences (Vol. 1 and 2).* Stanford University Press. Caplan P. J., Crawford M., Hyde J. S., & Richardson J. T. (1997). *Gender Differences in Human Cognition*. *Counterpoints: Cognition, Memory, and Language Series*. Oxford University Press. Nash, A., & Grossi, G. (2007). *Picking Barbie™'s Brain: Inherent Sex Differences in Scientific Ability*?. Journal of Interdisciplinary Feminist Thought, 2(1), 5.

hormones (Kimura 1992), test results can be influenced by simple task description changes from (masculine) spatial skills to (feminine) empathic skills, by replacing abstract forms with human figures. (Birket 1976; Naditch 1976; Sherman 1978, p 229-30; Sharps & al. 1993, 1994; note c.f. Richardson 1994)[98] Terlicki, Newcombe & Little (2008) and Feng, Spence & Pratt (2007) showed that playing 10 hours of first-person-shooter action video games substantially reduced the gender disparity in both spatial attention and mental rotation and had lasting effects.[99] Spatial training through 3D video games is now considered a viable technique to reduce sex differences in mental rotation abilities. (De Lisi & Wolford 2002, Quaiser-Pohl & al. 2006, Miller & Halpern 2013)[100]

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[98] Birkett P. (1976). Sex differences and reasoning vs. imagery strategies in the solution of visually and auditorily presented family relationship problems. *Bulletin of the Psychonomic Society*, 8(2), 139-142. Naditch, S. F. (1976). Sex differences in field dependence: The role of social influence. Determinants of gender differences in cognitive functioning. Paper presented at the American Psychological Association. Sherman, J. A. (1978). *Sex-related cognitive differences: An essay on theory and evidence*. Charles C Thomas. Sharps M. J., Welton A. L., & Price J. L. (1993). Gender and task in the determination of spatial cognitive performance. *Psychology of Women Quarterly*, 17(1), 71-82. Counterfindings in Richardson, J. T. (1994). Gender differences in mental rotation. *Perceptual and Motor Skills*, 78(2), 435-448.

[99] Feng, J., Spence, I., & Pratt, J. (2007). Playing an action video game reduces gender differences in spatial cognition. *Psychological science*, *18*(10), 850-855. Control subjects who played a non-action game showed no improvement. See also Terlecki, M. S., Newcombe, N. S., & Little, M. (2008). Durable and generalized effects of spatial experience on mental rotation: Gender differences in growth patterns. Applied Cognitive Psychology, 22(7), 996–1013.

[100] Terlecki, M. S., & Newcombe, N. S. (2005). How important is the digital divide? The relation of computer and videogame usage to gender differences in mental rotation ability. *Sex Roles*, *53*(5), 433-441. De Lisi R., & Wolford J. L. (2002). Improving children's mental rotation accuracy with computer game playing. *The Journal of genetic psychology*, 163(3), 272-282. Miller, D. I., & Halpern, D. F. (2013). Can spatial training improve long-term outcomes for gifted STEM undergraduates?. Learning and Individual Differences, 26, 141-152.

Green, C. S., & Bavelier, D. (2007). Action-video-game experience alters the spatial resolution of vision. *Psychological science*, 18(1), 88-94. Dye, M. W., Green, C. S., & Bavelier, D. (2009). Increasing speed of processing with action video games. *Current directions in psychological science*, 18(6), 321-326. Dye M.W. & Bavelier D. (2010). Differential development of visual attention skills in school-age children. *Vision Research*, 50, 452–459. Quaiser-Pohl C., Geiser C., & Lehmann W. (2006). The relationship between computer-game preference, gender, and mental-rotation ability. *Personality and Individual Differences*, 40(3), 609-619. Quaiser-Pohl & al. found the effects of action and simulation games only on male children, though the group was overwhelmingly male (82%), while the non-player and logic game players were primarily female (82% and 83% respectively).

Daphne Bavelier and C. Shawn Green (2003, 2006, 2007, 2010, 2011, 2012, 2017) have researched the cognitive effects of action video games for the past 15 years and have found significant positive enhancements in visual attention and spatial skills for video game players.[101] They tested first-person-shooters (FPS) action games whose primary audiences are adolescent and young adult males. FPS players not only have better spatial skills, they have better object tracking, visual selective attention and increased processing speeds. Bavelier has expressed concern that FPS player's cognitive advantages will only reinforce the male advantage in the spatial-skills sex-difference debates, but their research also reinforces the notion that the types of games and toys given to children affect their cognitive and motor development.

The types of games children are given impact their cognitive skill and most likely results in different cerebral development and spatial skills. Boys are frequently encouraged to engage in gross motor play activity that takes up physical space: ball games, cars and other forms of exuberant physical exertion. Their play rarely mimics mundane real-world adult male concerns. Girls are encouraged to engage in fine motor skill activities that

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[101] Green, C. S., Kattner, F., Eichenbaum, A., Bediou, B., Adams, D. M., Mayer, R. E., & Bavelier, D. (2017). Playing some video games but not others is related to cognitive abilities: A critique of Unsworth et al.(2015). *Psychological science*, 28(5), 679-682. Bavelier D., Green CS, Schrater P., & Pouget A. (2012). Brain plasticity through the life span: Learning to learn and action video games. *Annual Reviews of Neuroscience*, 35, 391-416. Bavelier D., Green C.S., Han D.H., Renshaw P.F., Merzenich M.M., & Gentile D.A. (2011). Brains on video games. Perspectives in Nature Review in *Neuroscience*. 12, 763-768. Green, C.S. & Bavelier, D. (2012). Learning, attentional control and action video games. *Current Biology*, 22, 197-206. Dye M.W. & Bavelier D. (2010). Differential development of visual attention skills in school-age children. *Vision Research*, 50, 452–459. Dye, M. W., Green, C. S., & Bavelier, D. (2009). Increasing speed of processing with action video games. *Current directions in psychological science*, 18(6), 321-326. Green, C. S., & Bavelier, D. (2007). Action-video-game experience alters the spatial resolution of vision. *Psychological science*, 18(1), 88-94. Green, C. S., & Bavelier, D. (2006). Effect of action video games on the spatial distribution of visuospatial attention. *Journal of experimental psychology: Human perception and performanc*e, 32(6), 1465. Green, C. S., & Bavelier, D. (2006). Enumeration versus multiple object tracking: the case of action video game players. *Cognition*, 101(1), 217-245. Green, C. S., & Bavelier D. (2003). Action video game modifies visual selective attention. *Nature*, 423(6939), 534-537.

mimic the chores that they will later be expected to take up in the service of others, like childcare, house-cleaning, cooking, etc. (Young 2005, Sweet 2014) Test subjects are likely to be men and women who have grownup for 18-20 years in a gendered milieu — with different toys, recreational and physical activities, territorial boundaries, and social interactions, not to mention different nutrition that can influence brain plasticity[102]. They are not a generic test subject whose brain and cognitive variations comes down to hardwired biological differences.[103] No biologically motivated test of sex-differences has been able to remove the influence of growing up in a gendered environment. (Parlee 1981)

As Mary Crawford and Roger Chaffin mention in their critique of the study of sex differences,

> *"… rather than being a neutral or objective tool for uncovering the fundamental natures of women and men, science is a social enterprise that is embedded in relationships of power. Differences that are 'documented' have invariably been used to legitimate and defend existing differences in power." (p 81)* [104]

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[102] Important sex-differences in physiological size and strength may be result of gendered-differences access to nutrition and incitement towards physical activities. Nu, C. T., MacLeod, P., & Barthelemy, J. (1996). Effects of age and gender on adolescents' food habits and preferences. *Food quality and preference*, 7(3-4), 251-262. Rolls, B. J., Fedoroff, I. C., & Guthrie, J. F. (1991). Gender differences in eating behavior and body weight regulation. *Health Psychology*, 10(2), 133.O'dea, J. A., & Caputi, P. (2001). Association between socioeconomic status, weight, age and gender, and the body image and weight control practices of 6-to 19-year-old children and adolescents. *Health education research*, 16(5), 521-532.Hayes, D., & Ross, C. E. (1987). Concern with appearance, health beliefs, and eating habits. *Journal of Health and Social Behavior*, 120-130. Nube, M., & Van Den Boom, G. J. M. (2003). Gender and adult undernutrition in developing countries. *Annals of human biology*, 30(5), 520-537. Barbat-Artigas, S., Dupontgand, S., Pion, C. H., Feiter-Murphy, Y., & Aubertin-Leheudre, M. (2014). Identifying recreational physical activities associated with muscle quality in men and women aged 50 years and over. *Journal of cachexia, sarcopenia and muscle*, *5*(3), 221-228.

[103] Halpern D. F., Benbow C. P., Geary D. C., Gur R. C., Hyde J. S., & Gernsbacher M. A. (2007). The science of sex differences in science and mathematics. *Psychological science in the public interest*, 8(1), 1-51.

[104] Crawford, M. & Chaffin, R. (1997) The Meanings of Difference. In Caplan P. J., Crawford M., Hyde J. S., & Richardson J. T. (Eds.)*Gender Differences in Human Cognition*. Counterpoints: Oxford, 81.

Wine, Moses and Smye (1980) looked at patterns in the history of sex difference research. When males display more of a relevant quality, it has been given a positive, high status label like 'assertiveness' rather than 'aggressiveness' or 'rudeness,' while a qualities found in females have been given negative, low status labels like 'dependency' or 'immaturity' instead of 'greater interpersonal skills.'[105] Martin (1991) did a similar exercise in her article "The egg and the sperm: How science has constructed a romance based on stereotypical male-female roles." Female reproductive functions were given passive roles in scientific descriptions while the masculine reproductive components were infused with vigor and force, negating their co-dependent relationship.[106] The way biological determinist research frames itself as objective and unbiased masks some prejudicial ideological assumptions. Its labels and research subjects are not neutral, which will be discussed when we broach gender similarity theory. As such, evolutionary theories that rely solely on biological arguments to explain male domination appear weak, simplistic and heavily biased.

2.3.2.2 Cognitive Social Learning Theory/ Gender Schema Theory

Kohlberg's cognitive theory of gender development (1966)[107] emphasized the active role of children in gender socialization and how their understanding of gender roles influences

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[105] Wine, J. D., Moses, B., & Smye, M. D. (1980). Female superiority in sex difference competence comparisons: A review of the literature. In Stark-Adamec, C. (Ed.) *Sex roles: Origins, influences, and implications for women*, 148-163.

[106] Martin, E. (1991). The egg and the sperm: How science has constructed a romance based on stereotypical male-female roles. *Signs: Journal of Women in Culture and Society*, 16(3), 485-501.

[107] Kohlberg L. (1966). A Cognitive-Developmental Analysis of Children's Sex-role Concepts and Attitudes. In Maccoby E.E. (Ed). *The Development of Sex Differences*. Stanford University Press. 80-173.

their behavior, becoming more pronounced as they stabilize their understanding of their own sex.

> *"Cognitive perspectives on gender development (i.e., cognitive developmental theory and gender-schema theory) assume that children actively search for ways to make sense of the social world that surrounds them. Gender identity develops as children realize that they belong to one gender group, and the consequences include increased motivation to be similar to other members of their group, preferences for members of their own group, selective attention to and memory for information relevant to their own sex, and increased interest in activities relevant to their own sex."*
> (Martin & Ruble 2004, p 67)

Hyde (2014) adds that children's and adult's behavior are shaped by positive reinforcement and punishments. Common observations, toys, games, children's literature and television programming, etc. can provide these gender role reinforcement/social cues. Respected role models (while not always "positive") are also looked upon as sources of gender role social cues. She adds:

> *"In the more recent versions of the theory, cognitive components have been added, such as attention, self-regulation, and self-efficacy. For example, as children grow, control of their behavior shifts from externally imposed reinforcements and punishments to internalized standards and self-regulation. In particular, children internalize gender norms and conform their behavior to those norms.*
>
> *Self-efficacy, another cognitive component, refers to a person's belief in her or his ability to accomplish a particular task. Self-efficacy may be important in explaining certain gender effects. For example, although girls' math performance is equal to that of boys, generally there is a wider gender gap in math self-efficacy (d = 0.33, Else-Quest et al. 2010). Self-efficacy is important because of its power in shaping people's decisions about whether to take on a challenging task, such as majoring in mathematics."* (Hyde 2014 p 5)

Like cognitive social learning theory, Sandra Bem's gender schema theory (1981)[108] is a process-oriented theory that tries to explain how gender stereotypes and sex-linked characteristics become engrained and are transmitted in society. She argues that gender associated information is transmitted via gender-based schematic processing, or information networks, that allow "a generalized readiness to process information on the basis of sex-linked associations that constitute the gender schema. The theory proposes that sex typing results from the fact that the self-concept itself gets assimilated to the gender schema." (p 354)

Bem's theory of sex typing comes into play with the findings that sex-typed individuals have a greater readiness to process gendered characteristics, including about oneself. Her theory of sex–typing is that our culture, which "insists on the functional importance of the gender dichotomy," has two separate socially constructed norms of masculinity and femininity. These are combined to create a matrix of four primary genders (see Fig. 2.13): feminine, masculine, undifferentiated (low values of masculine and feminine traits) and androgynous (high values of masculine and feminine traits). An individual who is neither undefined nor androgynous will fall into the high masculine or high feminine category. If the individual's sex matches the gender, the individual is sex-typed; if the individual's sex and gender do not match, the individual is cross-sex typed.

Bem does not imply that other genders cannot exist, only that her gender schema theory explores the process of sex-typing in our culture's gender dichotomy. Sex-typing using the

[108] Bem, S. L. (1981a). Gender schema theory: A cognitive account of sex typing. *Psychological Review*, 88 (4), 354–364.

Bem Sex Role Inventory 1974) has been used to research the sex-typing the women in game development research presented in Chapter 5.

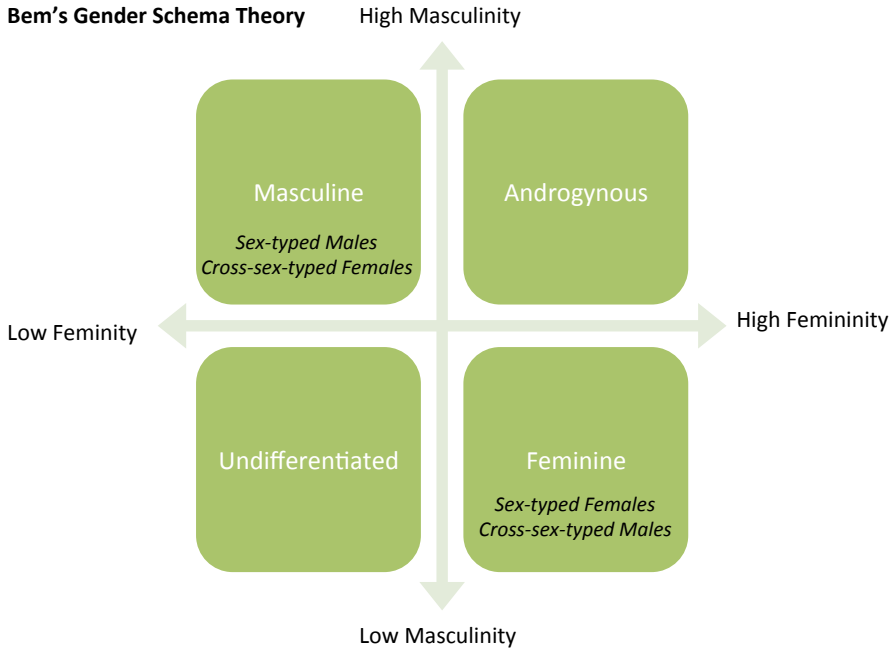

Figure 2.13 Sandra Bem's Gender Schema Theory and sex-typing categories (1981)

2.3.2.3 Sociocultural Theory

> *"Sociocultural theory, also called social role theory or social structural theory, was proposed by Eagly & Wood (1999; Wood & Eagly 2012) as an alternative to evolutionary theorizing about gender differences. The essential argument of the theory is that a society's division of labor by gender drives all other psychological gender differences. Psychological gender differences result from individuals' accommodations or adaptations to the particular restrictions on or opportunities for their gender in their society."* (Hyde 2014 p 6-7)

Unlike evolutionary theory, socio-cultural theory focuses on gender difference variations across cultures. Cross-national research found that countries with greater gender equality — measured by factors like greater representation of women in government, more women in researcher positions and lower wage gaps — also predicted lower gender differences in math performance, math self-concept and math self-efficacy. (Else-Quest &

Al. 2010) Sociocultural theory and expectancy value theory work in tandem.

2.3.2.4 Expectancy Value Theory

According to Eccles's expectancy-value theory (Eccles et al. 1994, Meece et al. 1982), two primary factors contribute to a person's decision to take on a challenging task:

- Expectancies (expectations for success at the task) and
- Task values (e.g., interest in the task, usefulness of the task for current or future goals).

Expectancies of success may be influenced by a person's self-concept of ability, past achievement experiences (e.g. grades in past courses, scores on standardized tests), socializers' beliefs and behaviors (e.g. peer, teacher or parents' belief in the student's capabilities), and the broader sociocultural milieu (i.e., the occupation's gender distribution).

Parents are expectancy socializers that transmit their expectancies onto their children. Cooper and Weaver (2003, p 67-87) analyzed years of gender research into expectancies of success and failure with computers. For example, with similar test results and similar effort levels (i.e., time spent doing homework), parents of daughters felt that math was more difficult for their child than parents of sons or that their sons had higher math abilities. (Parsons & Al 1982) Parents with more gender-stereotypic beliefs in math skills believed their sons had higher abilities than parents of daughters. (Tiedemann 2000). In turn, girls said they had to work harder to get positive results on their math exams and attributed success to luck and effort, while boys were quicker to attribute their success to

superior ability. Girls attributed their failure to be a reflection of their weaker ability (stable internal factor), while boys attributed failure to bad luck (unstable external factor). In other words, identical performance and effort yielded different explanations and expectancies.

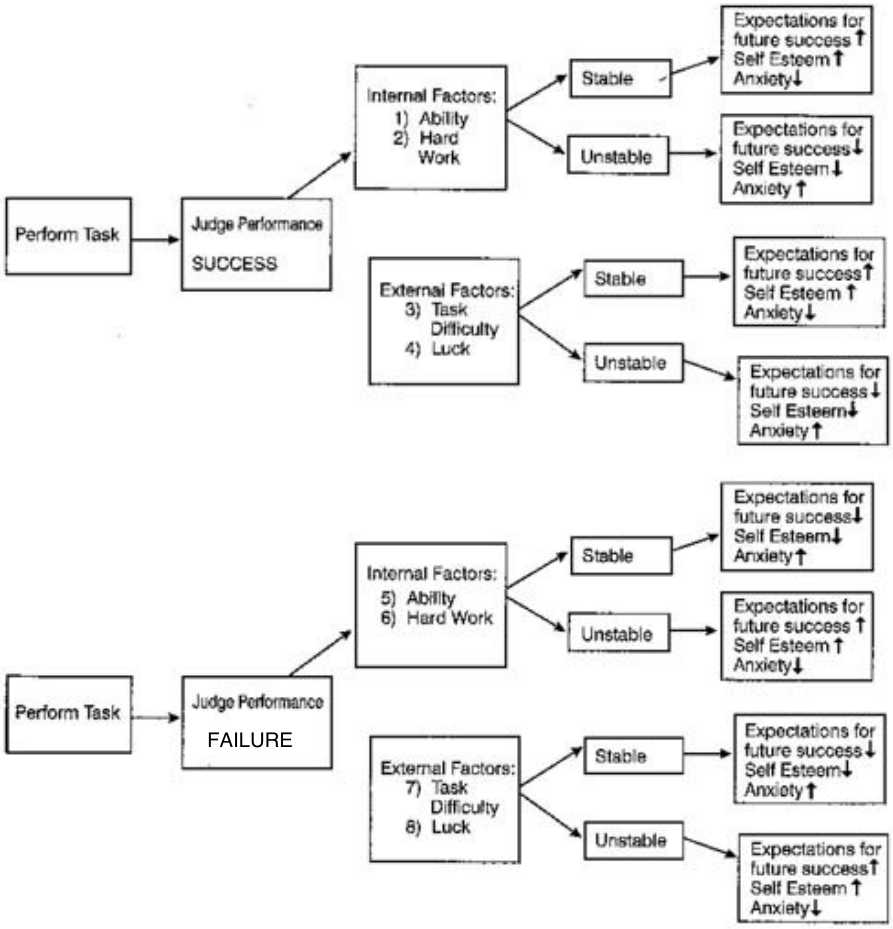

Figure 2.14 Attribution stages for successful and failing outcomes (Weiner 1986) © Cooper & Weaver 2003, p77

Deaux' (1976) research on sex-differences in the attribution process found that women have consistently lower expectations for success.[109] An unexpected outcome will be

[109] Deaux K. (1976). Sex: A perspective on the attribution process. In Harney J.H., Ickes W.J., &Kidd R.F. (eds.) *New directions in attribution research*, 1, 335-352. Lawrence Erlbaum Associates.
Deaux K., & Emswiller T. (1974). Explanations of successful performance on sex-linked tasks: What is skill for the male is luck for the female. *Journal of Personality and Social Psychology*, 29(1), 80.
Deaux K., & Lewis L. L. (1984). Structure of gender stereotypes: Interrelationships among components and gender label. *Journal of personality and Social Psychology*, 46(5), 991.
Deaux K., & Major B. (1987). Putting gender into context: An interactive model of gender-related behavior.

attributed to a temporary cause like luck and effort, and an expected performance will be attributed to a stable cause like ability. Deaux mentions that if an event is attributed to a temporary factor, then future expectancies may remain unchanged, producing a self-perpetuating cycle.

Clance & Imes (1978)[110] build on Deaux's findings in support of their Impostor Phenomenon theory:

> *"In line with their lower expectancies, women tend to attribute their successes to temporary causes, such as luck or effort, in contrast to men who are much more likely to attribute their successes to the internal, stable factor of ability. Conversely, women tend to explain failure with lack of ability, whereas men more often attribute failure to luck or task difficulty. Given the lower expectancies women have for their own (and other women's) performances, they have apparently internalized into a self-stereotype the societal sex-role stereotype that they are not considered competent (see Broverman, et al., 1972; Rosenkrantz, et al., 1968). Since success for women is contraindicated by societal expectations and their own internalized self-evaluations, it is not surprising that women in our sample need to find explanation for their accomplishments other than their own intelligence -- such as fooling other people."*
> (Clance & Imes 1978, p 242-3)

The impostor phenomenon calls on the stereotype threat of female incompetence in math, science and technology as one of the conditions for this negative experience to be triggered in highly accomplished women. As we saw in the previous section, stereotype

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Psychological review, 94(3), 369.
Deaux K., Winton W., Crowley M., & Lewis L. L. (1985). Level of categorization and content of gender stereotypes. *Social Cognition*, 3(2), 145-167.
Deaux, K., & Taynor, J. (1973). Evaluation of male and female ability: Bias works two ways. *Psychological reports*, 32(1), 261-262.

[110] Clance, P. R., & Imes, S. A. (1978). The Impostor phenomenon in high achieving women: Dynamics and therapeutic intervention. *Psychotherapy: Theory, Research & Practice*, 15(3), 241.
Clance, P. R. and O'Toole, M. A. (1987). The impostor phenomenon: an internal barrier to empowerment and achievement. *Women and therapy* (6): 51-64.

threat can influence expectancies of success by creating pressure on the performance of out-group members. Shih, Pittinski & Ambody's research (1999) on Asian females at a prestigious U.S. university tested three stereotype conditions by making each identity salient right before the test through a questionaire.[111] The three conditions were:

- Positive condition, Asian stereotype boost by stressing their self-identification as Asians prior to the exam through questions of which language was spoken at home and at school;
- Control condition, no identity was brought forth through neutral questions about the university telephone and internet service, and
- Negative stereotype threat condition, students had to answer questions about their co-ed or single-sex dormitories, making their female identity salient.

Results from this singularly accomplished group of Asian American university women showed the effects of making positive and negative identities salient in their performance results. Asian identity salience had the best average results with 54% correct answers; the control group had 49% positive responses; and the female identity salience had only 43% average positive answers. (see Fig. 2.15)

[111] Shih, M., Pittinsky, T. L., & Ambady, N. (1999). Stereotype susceptibility: Identity salience and shifts in quantitative performance. *Psychological science*, 10(1), 80-83.

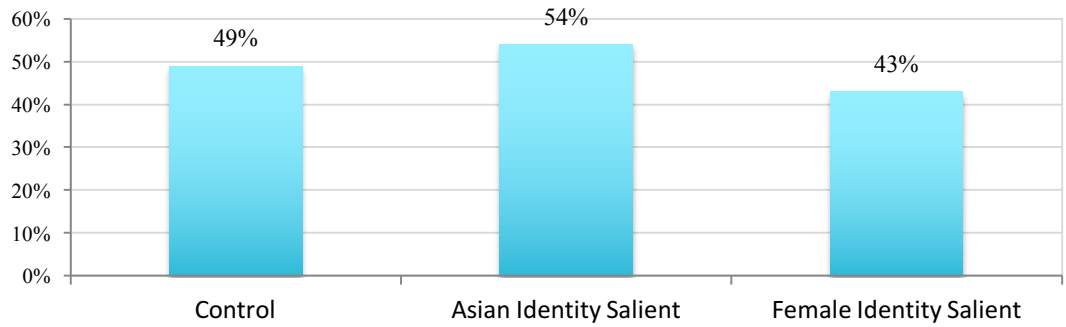

Figure 2.15 Percentage of correct math answers depending on which identity was made salient (Shih & Al. 1999)

Researchers that stress sex-difference in mathematical achievements — without thoroughly examining the cultural context of their methodology and research subjects — help maintain lower female expectancy values and stereotype threat. For example, Benbow & Stanley (1983) often-cited paper[112] focused on gifted student's mathematical performance:

> *"Almost 40,000* ***selected*** *seventh-grade students from the Middle Atlantic region of the United States took the College Board Scholastic Aptitude Test* ***as part of the Johns Hopkins regional talent search in 1980, 1981, and 1982****. A* ***separate nationwide talent search*** *was conducted* ***in which any student under age 13 who was willing to take the test was eligible****. The results obtained by both procedures establish that by age 13 a large sex difference in mathematical reasoning ability exists and that it is especially pronounced at the high end of the distribution: among students who scored greater than or equal to 700, boys outnumbered girls 13 to 1."*
> *(Benbow & Stanley, 1983, p 102) (my emphasis in bold)*

The assumption is that by virtue of the number of participants, we have statistical proof of sex-differences in mathematical ability. The study also assumes that these boys and girls were products of **equivalent** education, recognition of their abilities and encouragement. If parental, teacher and student expectations assume a greater mathematical ability in

[112] Benbow, C. P., & Stanley, J. C. (1983). Sex differences in mathematical reasoning ability: More facts. *Science,* 222(4627), 1029-1031.

male students, gifted male students are more likely to be encouraged as they progress in their education, develop stable expectations of success, and be selected and/or encouraged to enter a national math talent search competition from a prestigious American university. The seventh graders tested have been raised for 13 years in an undoubtedly gendered milieu[113], and they do not enter the contest as neutral subjects and beneficiaries of equivalent encouragement.

The SAT is a well-known test for U.S. college-bound 17-18 year olds, not for 12-13 year olds who will cover these math concepts only later in their education, and can produce stereotype threat in high school females that identify with mathematical ability. A math talent competition using a national college entrance exam for a much younger audience is assumed to try to identify math **geniuses**, which is a masculine stereotype.

As a "gifted and talented" 7th grade girl in Texas in the 1981, I was encouraged by my teacher to participate in the national section of the "math talent search." I saw this as an ominous opportunity to confirm my social milieu's doubts in my math abilities, my coolness, my lack of femininity or my sexuality (which was important to me in 7th grade when I was stumbling into puberty).

Direct competition was something I had abhorred about Math Club. Who cares who is better or faster at math? We have calculators for that. What would I gain from participating? Confirmation I was a true geek like my (male) former peers from Math Club? What if I failed and was publicly unmasked as an impostor? No thank you... Without

[113] Honig, A. S. (1983). Sex role socialization in early childhood. *Young Children*, 38(6), 57-70.

a moment of doubt, I chose not to participate. While I really enjoyed math, stereotype threat stared me in the face. To this day, I *still* get anxious on any standardized exam.

In hindsight, the potential damage to my self-esteem was much more real and threatening to me than the slim chance of public recognition of my "talent." Why would a girl opt-in if everyone believes boys are naturally more gifted in math, where the best-case scenario is that she could confirm her geek/nerd status with the risk of proving girls are not as good? This is a classic stereotype threat situation for the girls. What would be even more interesting than the skewed SAT male genius results would be a study to see how many girls identified as gifted and talented in math chose not to participate in this overt competition.

Even worse, this type of study now reifies the stereotypes of male scientific genius and women's lesser mathematical abilities. These socio-cultural and expectancy-value factors are often identified as contributing to the underrepresentation of women in STEM and point to where interventions may be effective. (Hyde 2014 p 7-8)

2.3.2.5 Theories of Gender Similarity

Hyde (2005 & 2014) proposes a theory of gender similarity[114] whereby societies with greater equality between the sexes and decreased cost of gender-role transgression tend towards greater gender similarities.

[114] Hyde, J. S. (2005). The gender similarities hypothesis. *American psychologist*, 60(6), 581.

Hyde's primary research activity is in the form of 46 different gender meta-analyses that she completed up to 2005. She describes her methodology:

> *"Gender meta-analyses generally proceed in four steps: (a) The researcher locates all studies on the topic being reviewed, typically using databases such as PsycINFO and carefully chosen search terms. (b) Statistics are extracted from each report, and an effect size is computed for each study. (c) A weighted average of the effect sizes is computed (weighting by sample size) to obtain an overall assessment of the direction and magnitude of the gender difference when all studies are combined. (d) Homogeneity analyses are conducted to determine whether the group of effect sizes is relatively homogeneous. If it is not, then the studies can be partitioned into theoretically meaningful groups to determine whether the effect size is larger for some types of studies and smaller for other types. The researcher could ask, for example, whether gender differences are larger for measures of physical aggression compared with measures of verbal aggression." (Hyde 2005, p582)*

In conclusion to her research, she states:

> *"The gender similarities hypothesis stands in stark contrast to the differences model, which holds that men and women, and boys and girls, are vastly different psychologically. The gender similarities hypothesis states, instead, that* ***males and females are alike on most—but not all—psychological variables****. Extensive evidence from meta-analyses of research on gender differences supports the gender similarities hypothesis. A few notable exceptions are some motor behaviors (e.g., throwing distance) and some aspects of sexuality, which show large gender differences. Aggression shows a gender difference that is moderate in magnitude." (Hyde 2005, p. 590)*
>
> *…* ***Gender differences can vary substantially in magnitude at different ages and depend on the context in which measurement occurs.*** *Overinflated claims of gender differences carry substantial costs in areas such as the workplace and relationships*." *(Hyde 2005, p. 581) (my emphasis in bold)*

Hyde found significant differences in motor performance (throwing velocity and distance), particularly after puberty. Gender differences in physical aggression are larger than verbal aggression. Most important for our purposes, differences were slight in the measures relating to intellectual performance: math and verbal ability. (p. 586)

Publication bias[115] — against papers finding slight to no sex-difference and the increased likelihood of papers and presentations finding significant sex-differences being published in high-citation publications — means that findings of sex-differences may get out-sized media attention. This also means that research findings showing no or slight sex-differences may not even enter in meta-analyses.

Published studies showing significant sex-differences in turn get more media traction in mass-media like newspapers, magazines, television, online and social media. If the Benbow & Stanley (1983) study is just taken at face value, the male genius and female math incompetence stereotypes are reinforced through repetition and dissemination. While Google Scholar's scientific citation to the Benbow & Stanley (1983) paper is 723 citations, dwarfed by the 2652 citations for Hyde's "Gender Similarities Hypothesis" (2005), Benbow and Stanley get better traction in mass-market publications because it feeds and reinforces the gender norms.

Once again **putting research in context is crucial**. For example, high school female math scores surpass male math scores in highly egalitarian nations like Finland and inverses incrementally in more patriarchal nations. (Else-Quest & Al. 2010)[116] Hyde also mentions

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[115] Easterbrook, P. J., Gopalan, R., Berlin, J. A., & Matthews, D. R. (1991). Publication bias in clinical research. *The Lancet*, *337*(8746), 867-872. *"Studies with statistically significant results were more likely to be published than those finding no difference between the study groups (adjusted odds ratio [OR] 2·32; 95% confidence interval [CI] 1·25-4·28). Studies with significant results were also more likely to lead to a greater number of publications and presentations and to be published in journals with a high citation impact factor. An increased likelihood of publication was also associated with a high rating by the investigator of the importance of the study results, and with increasing sample size. The tendency towards publication bias was greater with observational and laboratory-based experimental studies (OR=3·79; 95% CI=1·47-9·76) than with randomised clinical trials (OR=0·84; 95% CI=0·34-2·09). We have confirmed the presence of publication bias in a cohort of clinical research studies."* (Easterbrook & al. 1991, p 867)

[116] Else-Quest, N. M., Hyde, J. S., & Linn, M. C. (2010). Cross-National Patterns of Gender Differences in Mathematics: A Meta-Analysis. *Psychological Bulletin*, 136(1), 103-127.

how gender differences are easily manipulated by the research context such as whether the participants are deindividuated to remove the influence of gender norms (Lightdale & Prentice, 1994) or the influence of a public versus private context (Eagly & Crowley, 1986).

Hyde stressed how inflated claims of gender differences do real lasting harm, not just to females, but to males as well.

"One cost to children is that mathematically talented girls may be overlooked by parents and teachers because these adults do not expect to find mathematical talent among girls. Parents have lower expectations for their daughters' math success than for their sons' (Lummis & Stevenson, 1990), despite the fact that girls earn better grades in math than boys do (Kimball, 1989) … In short, girls may find their confidence in their ability to succeed in challenging math courses or in a mathematically oriented career undermined by parents' and teachers' beliefs that girls are weak in math ability….

It is time to consider the costs of overinflated claims of gender differences. Arguably, they cause harm in numerous realms, including women's opportunities in the workplace, couple conflict and communication, and analyses of self- esteem problems among adolescents. Most important, these claims are not consistent with the scientific data." (Hyde, 2005, p 590)

In conclusion, the significant sex-differences in gross motor performance, sexuality, and physical aggression should not be problematic for women to be successful in an ICT career.

2.3.3 Feminist Technology

This dissertation focuses on researchers that specialize in feminist theory and technology studies that influence my analysis of the video game industry/metabolism. In this subchapter, we will explore the feminist technology theories of Peggy McIntosh, Paola Tabet, and Cynthia Cockburn that altered my understanding of technology away from a naturally evolving masculine discipline towards an artificially controlled patriarchal milieu.

2.3.3.1 McIntosh: Five Interactive Phases of Curricular Revision

Peggy McIntosh (1983 & 1990) developed the "five interactive phases of curricular revision" theory that can help us frame the discourse around women and technology as an evolving process that can be applied to any discipline using the lens of any minority social group.[117] McIntosh's theory is particularly helpful for framing the structure of my research and its evolving viewpoints over six years — with each phase of my research leading into a new curricular revision phase.

1. **Phase 1: Womanless technology**. Monoculturalism, or single-system seeing, is defined by white heterosexual male cultural norms. "Monoculturalism… is blind to its own cultural specificity. It cannot see itself. It mistakes its "givens" for neutral, preconceptual ground rather than for distinctive cultural grounding." (McIntosh, 1990, p 35) This focus on "winners" (written by "winners") is the most frequent state in milieus that do not question the status quo or hegemonic narratives. Doubt in this monoculture that excluded women from ICT was my starting point when I embarked on this dissertation.
2. **Phase 2: Women in technology**. Lowering the focus slightly below the "pinnacle of extraordinary ingenuity," exceptional female achievements are acknowledged based on monoculture's existing terms and standards. We find women like Ada Lovelace (1815-1852), Grace Hopper (1906-1992), Jean Bartik (1924-2011), Betty

[117] McIntosh, P. (1983). Interactive Phases of Curricular Re-Vision: A Feminist Perspective. *Multicultural Prism : Voices from the Field*. Wellesley, MA: Center for Research on Women. McIntosh, P. (1990). Interactive Phases of Curricular Re-Vision: A Feminist Perspective. *Multicultural Prism : Voices from the Field*. Wellesley, MA: Center for Research on Women

Holberton (1917-2001), Annie Easley (1933 – 2011), etc. By finally writing in these brilliant women's gender-transgressive pioneering scientific and technological accomplishments into our historical narrative, we inadvertently confirm that women's performance must reach the highest levels to be acknowledged. This could be a reason why female engineering students with B averages drop out of ICT programs, while male students with C averages think they are doing fine.[118] My literature review and focus on girl game pioneers like Brenda Laurel, Brenda Romero, Celia Pearce and Sheri Graner Ray pushed my research quickly out of Phase 2 to Phase 3 in search of the key to women in game development's stereotype threat resilience. Women must be able to believe that they can be merely average and have successful ICT careers.

3. **Phase 3: Women as a problem, anomaly, absence or victim**. By defining the status of women as the outsiders needing to fit in, Phase 3 still expects ICT's straight white male monoculture to define the standards that women are expected to mold themselves to. Instead of being seen as part of the norm, righteous anger can build from our "absence" in a discipline or from being seen as a problem or anomaly. Victimhood can also permeate Phase 3, but this where questions about who defines norms and standards begin to form. For example, I feel guilty that I taught the canons of modernist design, training my mostly female students to

[118] Gurer, D. and Camp, T. (1998). *Investigating the Incredible Shrinking Pipeline for Women in Computer Science- Final Report*. National Science Foundation Project 9812016.
American Association of University Women - AAUW (Hill C., Corbett C., & St. Rose A). (2010). *Why So Few? Women in Science, Technology, Engineering, and Mathematics.*

disregards the design work "non-winners"[119]. My MBTI and BSRI research falls into this phase; in my initial conclusion in 2013, I wondered how female resilience could be *encouraged*. Five years later, I ask myself why women should have to build resilience to hostile stereotype threat rather than addressing/ trying to change society's toxic gender stereotypes. My research into children's gender performance at the Gaité Lyrique morphed into Phase 4 through my realization of girls' parents' apathetic role in their children's introduction to technology.

4. **Phase 4: Women as technology**. In this phase, women take the initiative to do or make technology in a new way. Phase 4 is where I formulated my conclusion. Women have always been in technological production[120] and have always been playing video games. Women do not need validation from hostile gamers or hackers desperately holding on to their limited definitions of technological authenticity or legitimacy. This phase is about bridging the heroic "mastery" public system of beliefs with the "decency" private system of beliefs.
5. **Phase 5: Technology reconstructed to include us all**. McIntosh predicts this will take at least 100 years to achieve. Feminist researchers often work over very short time spans. This dissertation focuses on changes over 20 years, and the kinds of changes needed to make beliefs shift can take decades. 6000 years of patriarchy are not going to be reversed in 50 years.

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[119] Wolfe, T. (1981) *From Bauhaus to our House*. Macmillan. The white male design heroes of high modernism are referred to as the « White Gods ». I generally operated in Phase 2 with the work of Eileen Gray, Varvara Tsepakova, Marianne Brandt, Charlotte Perriand, Annie Albers, Ray Eames, Denise Scott Brown, etc.

[120]

2.3.3.2 Tabet: Masculine Production and Control of Tools and Weapons

Paola Tabet kicks off the ball with her 1979 publication of "Hand, Tools, Weapons"[121] which reframes ethnographic studies of hunter-and-gatherer cultures and what traditional ethnographers call its "complementary sexual division of labor." She brings a much-needed feminist lens to anthropology that focuses on the patriarchal hierarchy of production and access to tools and weapons in their sexual division of labor.

> *"among the subsistence activities, men are assigned those which require strength, courage, and initiative, and which are also defined as the most "energetic, arduous, and exciting occupations," with "a spice of excitement and risk"; to women, on the contrary, are assigned all those activities requiring "patient, rather dull labor" and in general "the more sober and somewhat more monotonous tasks." (*Tabet 1982, p 6)

She proceeds to show that women's subsistence activities are the activities that these cultures assign to *slaves* whenever possible. Women's subsistence activities – carrying firewood and water, weeding, transporting food, cooking — are deemed too degrading for men. Women (and slaves) grind cereals and grains like beasts of burden through hand-operations. (Water-powered and wind-powered mills are usually controlled by men.) Pottery by hand (slow and heavy) is a female activity; pottery with a wheel is considered a male operation. (p 35)

> *"While men's control over manual tools didn't exclude women from all tools and concerned mainly the conditions of their fabrication, with manual machines and animal traction or automatic machines an appropriation and a direct utilization of these machines by men is imposed. The control of production and of society requires direct control over these more complex instruments: only men will work machines. Must we consider that the separation line here passes between the one who possesses machines and the one who is*

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[121] Tabet, P. (1979). Les mains, les outils, les armes. *L'homme*, 19(3). 5-61.
Tabet, P. (1982). Hands, tools, weapons. *Feminist Issues*, 2(2), 3-62. Used for the translated quotes.

> *deprived of them? Between who has the fundamental means of production and who does not? The "masculinization" of activities linked with machines does not mean that women are always excluded. Their energy and their work will be employed in tasks which do not require the basic tool and the machine; their work can be "full time" but strictly subordinate to the work of him who possesses and uses fundamental techniques and instruments. So we have situations where women are not "craft specialists," but where they are used as motor power or "time and patience…" (Talbet 1982, p 38)*

Notions of prestigious and degrading work is precisely what gave the female computer programming pioneers like Beth Hollberton, Grace Hopper and Annie Easley the opportunity to climb out of the "computor" pool. Most worked for the army or space agency under male engineers primarily focused on machine *creation* rather than *use*. Female computors/programmers were paid less than men with similar productivity levels.

Tabet illustrated the brutally patriarchal cultures that control the production of efficient tools and weapons reserved for men, while women are under-equipped and have to use basic, inefficient tools (if any) for foraging and hunting small game. Women are often only given simple containers and digging sticks to unearth roots and to catch and kill small, slow game, while Hiatt (1974) estimated that foraging women supplied the majority of a tribes' daily caloric intake.[122]

Tabet put stereotypes of the weak female to rest with her analysis of hunting gathering traditions. For example, Yamana women, in the southernmost tip of Chile and Argentina swim out to retrieve the moored canoes in freezing water and push the boats out once men and children have climbed in. Women are expected to row to allow the men to stay focused on the hunt. At the end, women jump into freezing water to push the delicate

[122] Hiatt, B. (1974) Woman the Gatherer. In Woman's Role in Aboriginal Society, ed. E Gale. Australian Aboriginal Studies 36. Australian Institute of Aboriginal Studies.

vessels back to shore so the men and children don't get wet, and then swim back out to moor the canoes. The inadvertent benefit of this refreshing exercise is that more Yamana women know how to swim than Yamana men. (p 21-22)

As for !Kung gathering women of Nyae Nyae (Southwest Africa), the women cover eight miles in a day carrying their digging sticks, ostrich eggs and infants on their backs to dig up roots that take about 15 minutes each. After a day's backbreaking labor in mid-day heat, these frail 147 cm women were estimated to be carrying 23 kilos each on the four mile return trip. (p 14)

> *"Women are thus constantly denied the possibility of extending their body and their arms by complex tools which would augment their power over nature. No doubt they come up against the same limitations in intellectual work. Here is an aspect of sexual discrimination which it is essential to study. Yet to say that women are limited to their own bodies is a very optimistic description of the situation: we are not limited to our bodies; we are used as bodies. The physical appropriation of women by men doesn't mean only sexual exploitation and reproduction. It can impinge on bodily integrity and expression in many other ways: from constrained movement (through education, clothing, etc.), seclusion or confinement to the almost universal delimitation of space and prohibition of travel, to such irreversible injuries as footbinding, forced fattening, sexual mutilation, etc." (Tabet 1982, p 40)*

Tabet presents the hair-raising funeral ceremony of New Guinea's Dugum-Dani tribe described by Heider (1970, p 237-39) where men are expected to give pigs or other presents, and 3-6 year old girls sacrifice their fingers. Little girls who have kinship with the deceased only have one or two fingers cut off at a time with a stone ax, leaving the thumb and two fingers on at least one hand so as not to jeopardize the sexual division of labor. Only two out of 120 Dugum-Dani adult women were unmutilated, and by the age of ten, almost all girls had lost four to six fingers. Tabet includes Heider's original text, noteworthy for its casual dismissal of this barbaric practice. (p 38)

> *"The loss of fingers does not drastically limit a woman's activities. With both thumbs and two fingers on at least one hand, and in most cases usable stumps on the other, the women are able to manipulate the woman's thin digging sticks in garden work. They also roll string and make nets and do other fine work. Comments on the lack of fingers were rare, but once an older woman remarked, more in joke than complaint, that she could not wield the heavy men's digging stick.*
>
> ***Activities that require ten fingers, such as shooting with bow and arrow or handling heavy digging sticks or axes, are generally reserved for men, but these are just the activities that are characteristically masculine in most cultures.**" (Heider 1970, p 239.) (my emphasis in bold))*

The hunt for more prestigious, potentially dangerous game is usually left to the men of hunter & gatherer tribes. Women play an important role in the hunt but only with their bare hands by making noise to herd the prey to a location where it can be more easily slaughtered. The women usually do not capture or inflict death on these animals. Testart (2014) would argue that this habit of avoiding having animals slaughter by women is due to menstruation myths[123], which I prefer to qualify as misogynistic menstruation taboos used to degrade women and reinforce the patriarchy.

> *"Here we get to a question only lightly touched upon up to this point and whose importance can hardly be overstressed. It concerns the basic technology for the fabrication of tools and the materials used. Between male and female work, there exists a clear dichotomy whose reasons Murdock and Provost (1973:211-12) consider "obscure" since the possible explanation based on "the masculine advantage in physical strength..., seems scarcely an adequate one." It is the division of the natural world with regard to raw materials into two categories, one of which is forbidden to women, the other permitted. Hard materials, such as metals, stone, bone, wood, shell, horn, etc., are worked exclusively by men (the percentages are: metal 99.8 per- cent, wood 98.8 percent, stone 96.6 percent, bones, horn and shell 94.6 percent), while "soft or pliable" material (according to the terminology of Murdock and Provost), like earth, clay, skins, vegetable and animal fibers for braiding and weaving, can be worked by both sexes but are mainly worked by women. We can thus see between male and female activities a split as strict as that concerning the use of weapons (big game hunting, war, etc.)…" (Tabet 1982, p 40)*

[123] Testart, A. (2014). L'amazone et la cuisinière: anthropologie de la division sexuelle du travail. Gallimard.

Tabet shows the repetitive pattern of providing uneducated, dominated, potentially mutilated women with ineffective tools that confine them to subservient roles, whether it be for fishing, hunting or agriculture, extended to prohibitions against weapons manufacturing and wielding.

Tabet's painful and infuriating analysis explains how masculine domination of technology enables men's domination of women and shows that this is not a recent phenomenon. By providing a feminist reading of ethnographic texts, so-called "complimentary" sex-roles are debunked.

> *"Men's exclusive right to work hard materials reveals the solid rock upon which male domination is founded: the impossibility for women to make weapons for themselves, their dependence upon men for almost all instruments of production. Men's control of the production and use of tools and weapons is confirmed as the necessary condition of their power, based upon violence (the male monopoly of weapons) and upon the under-equipment of women (the male monopoly of tools). Only by excluding women from the production and use of weapons and tools have men been able to achieve the appropriation of women and such a utilization of them in work, sexuality, and reproduction of the species." (Tabet 1982, p 43)*

2.3.3.3 Cockburn: Men's Resistance to Sex Equality

Cynthia Cockburn's feminist technology studies[124] (1983, 1985, 1991, 1993) focuses on technological disruption and its impact on men and women at the organizational level.

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[124] Cockburn, C. (1983). *Brothers.* Sage Publications. Cockburn, C. (1988). *Machinery of dominance: Women, men, and technical know-how*. Northeastern University Press. Cockburn, C. (1991). *In the way of women: Men's resistance to sex equality in organizations* (No. 18). Cornell University Press.
Cockburn, C., & Ormrod, S. (1993). *Gender and Technology in the Making*. Sage Publications.

Her theories are particularly pertinent to the issues that women face coming into "skilled" masculine professions, such as ICT in general and video game development in particular.

Coming from a Marxist sociology background, the objective of her book, *Brothers: Male Dominance and Technological Change,* (1983) was to "study the human impact of technological change" through a detailed study of the radical changes digital technology was bringing to the printing industry. Cockburn stresses that class and gender are parallel social structures in technology studies that must be treated separately, because men of every social class benefits from the gender hierarchy. Cockburn explores the ways that men gain power and control over others: over men of lower social classes and women in general.

Technological advancements in an industry often leads to a "deskilling" of the male workforce, simplifying processes and making possible the performance of men's work by women usually for less cost. *Brothers* explores how the print industry underwent a radical shift in the 1980's, where compositors, or comps, were transformed from highly-paid, unionized craftsmen working with "hot metal" linotype machines to working with photo-compositing or tele-typesetting techniques, called "cold comp." Comps needed to be retrained from their specialized linotype keyboards to the new Qwerty keyboards that (female) typists were already using.

Working with hot metal typography implied assembling and carrying heavy plates, which was seen as a difficult, virile activity in a greasy, noisy environment that was incompatible with women's delicate physique, moral prudishness and weaker intellect: too much heavy lifting, too much standing, too much coarse language, and too complicated. (chpt. 6) Comps, who derived a strong sense of their masculine identity from their work and a

strong sense of masculine social cohesion from their trade guild (p 16-19), worried that the technological advancements brought job accessibility to the “unskilled” women who could now compete for their jobs since a comp’s physically demanding tasks were removed. Comps’ resentment of their “deskilling” due to cleaner-and-easier photo-typesetting processes and “feminine” Qwerty keyboards could at least be comforted by the fact that, thanks to strong trade union representation, they were able to maintain their high salaries.

Disruptive technologies often bring about a capitalist reorganization of labor to reduce labor costs, through a deskilling of expertise and reduction in labor-intensive or difficult processes. Additionally, when women enter a previously male profession (like law or medicine), salaries often decrease because of gender wage-gaps. Working conditions often degrade from less union representation. Neoliberalism upends this relationship even more.

Disruptive technologies also bring about reorganization of the sexual division of labor that reorganizes itself to keep men in control of technology and in its more lucrative or prestigious professions. This is principally done through union representation or the setting of professional qualifications that can be defined by trade unions, professional organizations or educational institutions. Trade unions almost always have male upper management, and in technological sectors that invariably have gender segregation, unions often defend (male) interests by qualifying certain (male) technical work as

qualified or skilled (like comps) and certain (female) technical work as unskilled, mundane and of limited need of qualifications (like data entry).[125]

If we step back and look at the description of prestigious masculine technological work like programming (sitting in an office at a desk in front of a computer all day; rational, detail oriented, logical work…) compared to what technical craftsmen gave as the reason women were not adapted to their field, programmer's work would be described as

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[125] Abundant research concerning gendered professional ICT qualifications and women's technology education are available:

Acker, J. (1990). Hierarchies, jobs, bodies: A theory of gendered organizations. Gender & society, 4(2), 139-158. Bix, A. S. (2002). Equipped for life: Gendered technical training and consumerism in home economics, 1920-1980. Technology and Culture, 43(4), 728-754. Bix, A. S. (2014). Girls Coming to Tech!: A History of American Engineering Education for Women. MIT Press. Kanter, R. M. (2008). Men and women of the corporation: New edition. Basic books. Rosser, S. V. (2006). Using the Lenses of Feminist Theories to Focus on Women and Technology. In Fox, M. F., Johnson, D. G., & Rosser, S. V. (Eds.). Women, gender, and technology, 13-46. University of Illinois Press. Hacker, S. L. (1981). The culture of engineering: Woman, workplace and machine. Women's Studies International Quarterly, 4(3), 341-353. Wajcman, J. (1991). Feminism confronts technology. Penn State Press. Wajcman, J. (2000). Reflections on gender and technology studies: in what state is the art?. Social studies of science, 30(3), 447-464. Wajcman, J. (2004). La construction mutuelle des techniques et du genre: l'état des recherches en sociologie. L'engendrement des choses, des hommes, des femmes et des techniques. D. Chabaud-Rychter and D. Gardey. Paris, Editions des archives contemporaines: 52-70. Wajcman, J. (2010). Feminist theories of technology. Cambridge journal of economics, 34(1), 143-152. In French: Buscatto, M., & Marry, C. (2009). «Le plafond de verre dans tous ses éclats». La féminisation des professions supérieures au xx e siècle. Sociologie du travail, 51(2), 170-182. Collet, I. (2004). "La disparition des filles dans les études d'informatique: les conséquences d'un changement de représentation." *Carrefour de l'Education*(17).Collet, I. (2005). *La masculinisation des études d'informatique Savoir, Pouvoir et Genre. Sciences de l'éducation.* Nanterre, Paris X. Thèse de doctorat sous la direction de Nicole Mosconi. Collet, I. & Mosconi, N. (2006). Genre et autoformation : le cas de l'informatique. *Education permanente*, 168). 137-148. Collet, I., & Mosconi, N. (2010). Les informaticiennes: De la dominance de classe aux discriminations de sexe?. *Nouvelles questions féministes*, 29(2), 100-113. Collet, I. (2011). Effet de genre: le paradoxe des études d'informatique. *tic&société*, 5(1). Daune-Richard, A. M. (2003). La qualification dans la sociologie française: en quête de femmes*. Le travail du genre, Les sciences sociales du travail à l'épreuve des différences de sexe.* J. Laufer, C. Marry and M. Maruani. Paris, La découverte: 138-150. Daune-Richard, A. M. and Marry, C. (1990). Autres histoires de transfuges? Le cas de jeunes filles inscrites dans des formations masculine de BTS et de DUT industriels. *Formation Emploi*(29): 35-50. Daune-Richard, A. M. Flament, C. Lemaire, M. and Marry, C. (1986). *Les filles dans les formations industrielles de technicien supérieur liées aux nouvelles technologies, le cas de BTS et de DUT dans l'académie d'Aix- Marseille*. Aix-en-Provence, LEST-CNRS. Ingarao, M. (2002). *Les services informatiques, une activité tertiaire qui résiste aux femmes? Un portrait économique et social des SSII*. Paris, Ministère des affaires sociales, du travail et de la solidarité, Service des droits des femmes et de l'égalité. Kergoat, D. (1978). *Ouvrières= ouvriers?. Critiques de l'économie politique*, (5). Kergoat, D. (1984). Masculin/Feminin: Division sexuelle du travail et qualification. *Cadres CFDT*, Paris, (313), 26-29. Kergoat, D. (1988). Le syllogisme de la constitution du sujet sexué féminin. *Le cas des ouvrières spécialisées. Cahiers de l'APRE*(7): 281-295. Laufer, J., Marry, C., & Maruani, M. (Eds.). (2003). *Le travail du genre: Les sciences sociales du travail à l'épreuve des différences de sexe*. La Découverte.

"feminine work" by the Comps. The mental gymnastics required to describe women's supposed weaknesses for intellectually rigorous professions are simply turned around. Our supposed "moral prudishness" gives way to descriptions of "emotional volatility;" women are too illogical one moment, too uncreative the next. Now, our supposed greater patience for concentrated, tedious, monotonous tasks are nowhere to be found.

The six female "sub-professional computors"[126] sent to program the ENIAC (1945), considered to be the first electronic computer, were chosen because male engineers working on the ENIAC thought the programming work was subservient. The six pioneering female programmers were culled from the 200 women who tediously hand-calculated ballistics tables for the military during WWII at the Moore School of Engineering, University of Pennsylvania in Philadelphia. Betty Holberton, Kay McNulty, Marlyn Wescoff, Ruth Lichterman, Betty Jean Jennings, and Fran Bilas, referred to as "the refrigerator ladies," often went on to have brilliant but completely invisible careers.

Isabelle Collet (2005) remarks that young males university student's technological infatuation with computer science begins to overshadow the steady stream of women heading into the discipline, to the point of making women almost invisible when dealing with percentages. (see Chapter 2.1.11.1, Figures 2.1-2.4) Men flock to professions that have good career opportunities, financial rewards, and prestige, and now that computer science is recognized as a key industry in the 21st Century, the hacker stereotypes

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[126] Charles Babbage Institute (1983) *Frances E. Holberton Oral Histories Project* (Women's History). https://conservancy.umn.edu/browse?type=subject&value=Women%27s%20history (retrieved April 12, 2018)

reinforce the idea of a natural male aptitude to serve as an invisible fence to keep women away.

If we look at contemporary ICT corporations that give lip service to increasing “diversity” in technology with women concentrated in ICT’s lowest echelons — assembling hardware or doing data entry — and tokenism at the top with Marissa Meyer and Sheryl Sandberg, we can question if ICT diversity initiatives are an accurate statement of corporate good-will.

This raises the questions: *Why* should productions teams be diversified? What is to be gained if men believe they are more productive working in teams of like-minded peers (i.e., a monoculture) without worrying about offending people or holding back their language? These issues will be explored in the Issues > Design Diversity (section 2.4.3).

2.3.4 Gendered Design

2.3.4.1 Masculinization of the ICT Industry through the masculinization of its artifacts.

Many researchers have talked about sexist or negative representations of women in video games as the Artifacts upon which the masculine video gaming domain is built (Bryce & Rutter, 2002; Behn-Morawitz & Maestro, 2009; Dill & Al 2005, 2008; Provenzo, 1991; Shaw, 2011, 2012; Sherman, 1997)[127] through such things as stereotype distortion of female victims in need of rescue or sexual trophies, leading to disassociation by female players. Other researchers point to differences in technological access or legitimacy (Harvey 2014, Harvey & Sheperd 2016; Schott & Horrel 2000s) and to gaming spaces (Bryce & Rutter, 2003 a&b, 2005). [128] Still others point the finger to the Diffusion of video

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[127] Bryce, J. & Rutter, J. (2002). Killing like a girl: gendered gaming and girl gamers visibility. *CGDC Conference Proceedings.* Finland: University of Tampere Press, 243–255. Behm-Morawitz, E., & Mastro, D. (2009). The effects of the sexualization of female video game characters on gender stereotyping and female self-concept. *Sex roles*, 61(11-12), 808-823. Dill, K. E., Brown, B. P., & Collins, M. A. (2008). Effects of exposure to sex-stereotyped video game characters on tolerance of sexual harassment. *Journal of Experimental Social Psychology*, 44(5), 1402-1408. Dill, K. E., Gentile, D. A., Richter, W. A., & Dill, J. C. (2005). Violence, sex, race and age in popular video games: A content analysis. In E. Cole & J. H. Daniel (Eds.), *Featuring females: Feminist analyses of the media* (pp. 115-130). Washington, DC: American Psychological Association. Fox, J., & Bailenson, J. N. (2009). Virtual virgins and vamps: The effects of exposure to female characters' sexualized appearance and gaze in an immersive virtual environment. *Sex roles*, 61(3-4), 147-157. Kafai, Y. B. (1998). Video game designs by girls and boys: variability and consistency of gender differences. In G. Cassell & H. Jenkins (Eds), *From barbie to mortal kombat: gender and computer games* (pp. 90–114). Cambridge, MA: MIT Press. Provenzo, E. (1991). *Video kids: Making sense of Nintendo*. Cambridge, MA: Harvard University Press. Sherman, S. R. (1997). Perils of the princess: gender and genre in video games. *Western Folklore*, 56, 243–258. Shaw, A. (2011). He could be a bunny rabbit for all I care!: Identification with video game characters and arguments for diversity in representation. *Think Design Play: The fifth international conference of the Digital Research Association (DIGRA*). September 2011. Shaw, A. (2012). Do you Identify As a Gamer? Gender, Race, Sexuality and Gamer Identity. *New Media & Society*, vol 14(1), 22-44.

[128] Bryce, J., & Rutter, J (2003a) Gender dynamics and the social and spatial organization of computer gaming. Leisure, 22 (1). pp. 1-15. Bryce, J., & Rutter, J. (2003b). The gendering of computer gaming: Experience and space. In S. Fleming, & Jones, I. (Eds.), *Leisure cultures: Investigations in sport, media and technology* (pp. 3-22). Eastbourne, UK: Leisure Studies Association.
Bryce, J., & Rutter, J. (2005) Gendered gaming in gendered space. In Raessens, J. & Goldstein, J. (Eds.), *Handbook* (p. 301-310). MIT Press. Harvey, A. (2015). *Gender, Age, and Digital Games in the* Domestic Context (Vol. 3). Routledge. Harvey, A. & Shepherd, T. (2016.) When Passion isn't Enough: Gender, Affect and Credibility in Digital Games Design. *International Journal of Cultural Studies,* 20(5), 492-508.

games — in the discourse of the publishers and the press, and the ephemera produced to market and sell games. (Burgess & al, 2007; Miller & Summer, 2007; Dill & Thill, 2007.)[129] We can add the feminist technology viewpoint of strategic masculinization of a discipline through production and control of its tools and techniques. In other words, video games are masculine because its tools and technology like video game consoles and personal computers are masculine as well. As we saw, the first programmers were female computors, often assistants to hardware engineers or scientists, like Ada Lovelace and the women of the ENIAC. So how and why did women get pushed out?

In her research involving thousands of U.S. children for Interval Research in 1994, Brenda Laurel (2004, p 19) states that computers are considered gender–neutral objects by both girls and boys, while video game consoles are for boys.[130] Other researchers found that computer are deemed more masculine. (Cooper & Weaver 2003).

If there is one type of technological artifact where there is no ambiguity, it's in the video game consoles. Lien (2013) traces Nintendo's role in establishing the video game console as a "boy's toy" after the crash of Atari's gender-neutral arcade and family console video

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Schott, G. R., & Horrell, K. R. (2000). Girl gamers and their relationship with the gaming culture. *Convergence: The International Journal of Research into New Media Technologies*, 6(4), 36-53.

[129] Burgess, M. C. R., Stermer, S. P. & Burgess, S. R. (2007) Sex, lies and video games: The portrayal of male and female characters on video game covers. *Sex Roles*, 57, 419-433. Miller, M. K., & Summers, A. (2007) Gender differences in videogame characters' roles, appearances, and attire as portrayed in video game magazines. *Sex Roles*, 57, 733–742. Dill, K. E., & Thill, K. P. (2007). Video game characters and the socialization of gender roles: Young people's perceptions mirror sexist media depictions. *Sex roles*, 57(11-12), 851-864.

[130] Laurel, B. (2004). *Design Research, Practice, and Principles For Digital Kids*. Exploratorium/MacArthur Foundation. Sep. 10, 2004.

Figure 2.16 Atari 800 Home Computer 1979

Fig. 2.17 Atari ad 1982

game business in 1983[131]. Atari had defined two different video game markets: *families* for its television-based console games, and *adults* for its arcade video games.

Atari's ads (Fig. 2.16-17) presented boys, girls, men and women enjoying video games and playing together. As Brenda Laurel explains later in this chapter, Atari's lack of design research and *laissez-faire* production oversight created a glutted market of low quality games that eroded consumer confidence — a pivotal factor of its market crash and bankruptcy. Nintendo made the conscious choice to align its Nintendo Entertainment System (NES) (1985) and its Game Boy (1989) as toys for boys under 10 rather than an as electronic device, keeping tight oversight on the quality of its game productions. Nintendo targeted its

[131] Lien, T. (2013). No Girls Allowed: Unraveling the story behind the stereotype of videogames being for boys. *Polygon*. http://www.polygon.com/features/2013/12/2/5143856/no-girls-allowed (retrieved August 17, 2015)

advertising to the boy under 10 years old market segment turning otherwise gender-neutral puzzle-platform games into explosive action-packed adventures with the tag line "now you're playing with power".[132] A few years later, Nintendo begins targeting boys aged 10-15.[133]

> *"Knowing that you have limited funding, …" says Rodger Roeser. "You need to have a very clearly differentiated and specific brand because that's going to play into where you're running your ads and what kind of ads you run. That niche-ing, that targeting makes it easier for marketers to have a very succinct conversation with their target without overspending and trying to reach everybody."*
>
> *The industry did the math. Companies like Nintendo aggressively sought out people who played their games. It began publishing its own video game magazine, Nintendo Power, which had enormous outreach and allowed the company to communicate with its customers… Publishers traveled to cities, held tournaments and got to see firsthand who was playing their games. The numbers were in: More boys were playing video games than girls."(Lien 2013)*

Perhaps the public gaming aspect encouraged more boys than girls to attend these otherwise innocuous events, but Nintendo's gendered marketing decision has had surprisingly profound effects on the ways we consider video game consoles. In the video game metabolic cycle, the restrictive link from Diffusion to Reception to Production occurs by gendering the video game console as a masculine interest thereby creating a self-fulfilling prophecy whereby the object is expected to be of interest to boys but not to girls. Perhaps the decline of women in computer science can be linked to the increasingly gendered marketing of video game consoles and personal computers for males, illustrated in Figure 2.18.

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[132] Nintendo Game Boy Commercial http://www.youtube.com/watch?v=Nt1vxzLfYYo circa 1989, see also https://www.youtube.com/watch?v=8TI64McyYF4.

[133] https://www.youtube.com/watch?v=v02WFh_Kdl0 17 Nintendo NES television commercials

"According to Simeon Spearman, a senior innovation strategist at marketing agency Engauge, this kind of marketing becomes a self-fulfilling prophecy. "If you look at the advertisements for games in the 1980s, you not only had an obvious assumption on the part of the marketers that video games were going to resonate more with young men, you also had them casting young men in the lead roles. They're cast in a way that perpetuates that stereotype - the belief that young men are the audience."

The ads made no distinction between different genres of games being for different people. Even nonviolent games like Tetris were painted with the same masculine brush when they appeared in ads for the Game Boy. It was, after all, the Game Boy, not the Game Girl." (Lien 2013)

Figure 2.18 ad by TBWA France for the Sony PS Vita 2013 © Sony/TBWA

Sexist stereotype reinforcement through advertising helped cement the belief that boys are into video games, and girls are not. In my research on children playing video games at the Gaité Lyrique (Chapt 6), I witnessed two archetypal video game gender transgressions: gamer girls benefiting from relative domestic chaos to develop their gaming capital and a dispassionate non-gamer boy who had access but didn't care.

2.3.4.2 Girl Games: Gendered Technology for Technological Delight

The Gaité Lyrique's gender neutral-games listed in Fig. 6.6 — on high rotation at the video game center — have no pretense about addressing a particular demographic. They are games for general audiences. What do we mean when we talk about Girl Games, often referred to as "pink" games? They are games that are meant to address the "special needs and interests" of preadolescent girls.

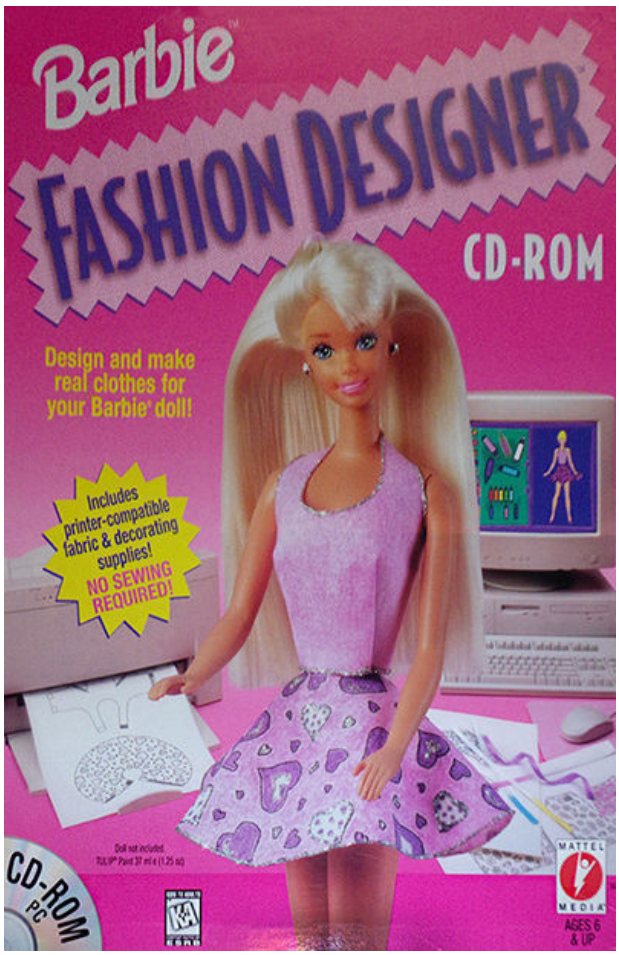

Figure 2.19 Barbie Fashion Designer CD ROM by Mattel Media, 1995

Girl games in the 1990s saw the pioneering firms of Mattel, Purple Moon and her Interactive. Each specialized in intellectual property for girls: Barbie for Mattel (1995-present), Rockett for Purple Moon (1997-99), and McKenzie and Nancy Drew for Her Interactive (1995-present).

Mattel's *Barbie Fashion Designer* (1995) was the game changer that proved that software for girls could be marketed to girls. Over 350 thousand copies were sold in its first year, making it 1996's 6th best selling software title.[134]

[134] Staff (February 26, 1997). 1996 PC Best Sellers. *Next Generation*.

Barbie Fashion Designer was sold in the toy aisle, since software stores did not have enough video games for girls to warrant a girls section, much less an aisle. The game, which was more of a technological clothing production tool than a game, straddled the gender divide by teaching about technology (using a mouse and keyboard, installing software, modifying and saving files, printing, reading patterns and modelmaking...) in order to make Barbie's clothing. However, Barbie is a perilous technological role-model, more known for her infamous pre-recorded quote: "math is hard!" or for *Barbie I can be a Computer Engineer* (2014)[135] where she gets the boys to repair her computer for her. Barbie is an "aspirational" character with a controversial adult body and glamorous fantasy lifestyle, while Rockett from Purple Moon is an empathetic character that young girls are meant to project onto to try out common, realistic social interactions.

In *Utopian Entrepreneur* (2001), Brenda Laurel dissects Purple Moon's demise, sold by impatient "rich guys" in a hostile takeover by Mattel to reduce Barbie's competition. Criticised in the feminist community for her biological determinism, she also explains her motivation to create products that "meet girls where they are." (p 28)[136] In the early 1990s, Laurel researched children's gameplay for Paul Allen's Interval Research Corporation, and founded Purple Moon based on her research findings in 1995. (Laurel's heuristics are outlined in the following section.) Laurel (2004) extended her research on *Computer as Theatre* (1991/2014), developing the importance of narrative gameplay for girls that formed the basis of her Rockett series.

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[135] https://gizmodo.com/barbie-f-cks-it-up-again-1660326671.

[136] Laurel, B. (2001). *Utopian Entrepreneur*. MIT Press, 2001.

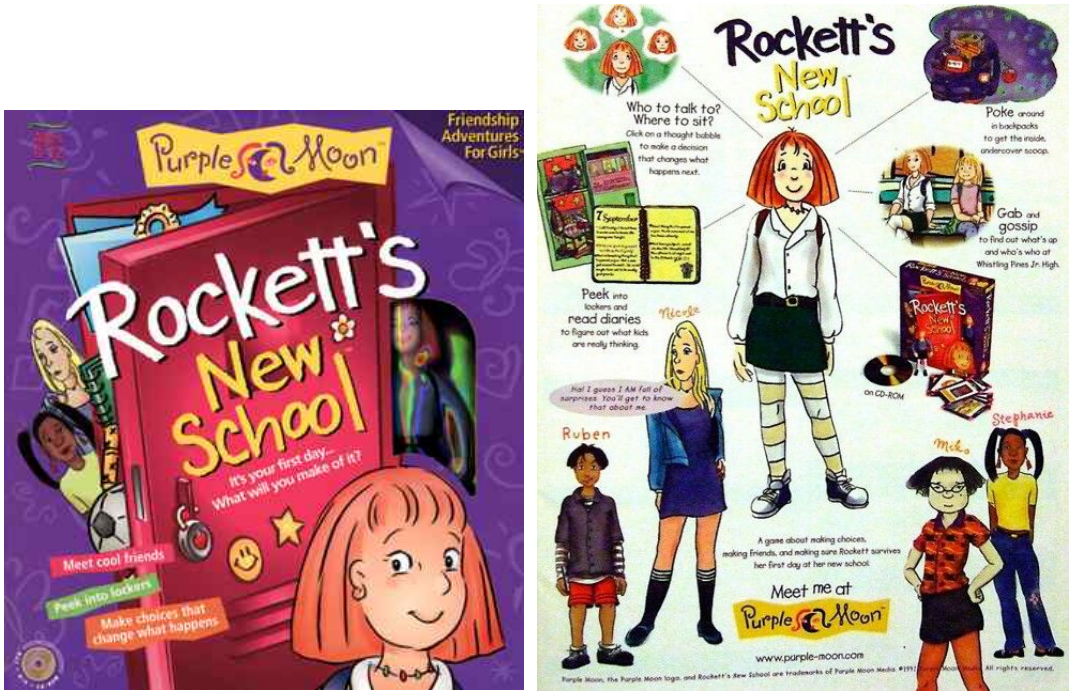

Figure 2.20 Purple Moon's first release, *Rockett's New School*, cover and advertisement 1997

Figure 2.21 Clockwise from top left, Purple Moon Place website, 2 screenshots of *Rockett's New School*, customization interface of *Rockett's Adventure Maker*, Rocket's World comic books.

This motivated Laurel to create not just Rockett's social simulation software, but a monitored community website and physical artifacts such as books. Purple Moon was in the midst of developing a doll when the hostile take-over occurred. Barbie and Rockett are the titles that come up most often when talking about the "good" girl games, video games for girls that are meant to provide technological delight as well as technological skills. Laurel was hurt by the chilly feminist reception to her Rockett series, accused of reinforcing performative gender through technology, but she defends her decisions about responding to girl's role-playing needs identified through her research of children's play patterns - that are de facto products of gender socialization. Rockett was a popular series for its consideration and responsiveness to the emotional needs of contemporary girls, certainly more so than Barbie. I refuse to throw stones at the Rockett series, because it is certainly in line with a valid "difference feminist" ideal (that we will discuss in the *Issues* section) that wants to renegotiate disparaged feminine values.

If we look at the other girl game companies frequently brought up with the Mattel and Purple Moon, Her Interactive stands out for their precocious start and the longevity of their *Nancy Drew* junior detective series now in its 31st sequel. Their first title was *McKenzie &C*o, 1995. Patricia Flannigan (for the American Laser Company) worked with the Albequerque New Mexico school district to research children's play through surveys, interviews and play study groups.[137] *Mckenzie & Co*. is also a point and click narrative games set in a high school that uses motion picture rather than still images or animations to develop its story line.

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[137] Ray, S.G. (2008). Chapter 15: Understanding the Game Industry. In Fullerton, T., Swain, C., Hoffman, S. (Eds.) *Alternatives: Games for Girls and Women*. *Game Design Workshop: a playcentric approach to creating innovative games* (Second ed.). Morgan Kaufmann. pp. 418–419.

Figure 2.22 McKenzie and Co by Her Interactive, 1995, cover and two screenshots

2.3.4.3 Designing for Children in the Monoculture

The considerable pressure to make successful products in an embryonic industry faced with tough competition for toy store shelf space (prior to the downloadable games era) meant that feminist values had to take a back seat to investors' expectations and impatience. Girl games could not take the risk of alienating anyone.

Both Rockett and McKenzie were the product of children's gameplay research – any research is already better than none — and its products sought to respond to the expressed needs of girls heading into adolescence with apprehension. Rockett and McKenzie are pragmatic solutions to "meet girls where they are." It's difficult to look beyond the limits to researching children who are not conscious of the

"monoculture/single-way-of-seeing" of their milieu. They therefore request social simulation tools to practice navigating into hostile waters. Girl games provide cultural survival strategies rather than feminist offensive strategies.

Huff & Cooper (1987) created a particularly interesting experiment[138] on the "effects of designer's stereotypes on the software they design" whereby 43 educators with educational game design experience were asked to design an educational game: one group designed for *boys*, one group designed for *girls*, and one group designed for *students*. The big conclusion was that the designs for *boys* and the designs for *students* produced similar educational games with fast reaction times and violent metaphors ("sudden death", explosions, etc.). This correlation between *boys* and *students* is not exactly surprising to anyone who has studied gender theory and understands hegemonic culture. What was interesting to observe was that the group who designed for girls designed a non-game, a "learning tool." The educational game for girls was more like a tutorial: didactic (frequent feedback in words rather than icons), patient (error tolerance and non-timed), and a little boring. Huff and Cooper found that "it is not the computer, or even the software, that is at the root of the sex bias in software, but the expectations and stereotypes of the designers of the software." (p 519)

Educators had essentialized their students down to two groups: *students* (boys and tomboys) who love video games, competition and want to show off their eye-hand

[138] Huff C., & Cooper J. (1987). Sex Bias in Educational Software: The Effect of Designers' Stereotypes on the Software They Design. *Journal of Applied Social Psychology*, 17(6), 519-532.

coordination, and girls (and sissies[139]) who dislike competition, frustration, and negative performances. And of course, if the teacher has to choose one piece of educational software for a class, we know *students*, aka *boys*, are privileged, even though further research shows that "feminine" educational software produces less anxiety and stereotype threat on boy's math performance than when girls use educational software with martial themes, like *Demolition Division*.[140]

2.3.4.4 Laurel: Designing Children's Digital Experiences

Besides her entrepreneurial endeavors, Brenda Laurel is a leading advocate and expert of design research for strategic product development through her influential publications.[141] In project funded by the MacArthur Foundation to improve the use of technology in extra-

[139] Tomboys and sissies are gender-transgressive children in Thorne, B. (1993) *Gender Play*. Rutgers University Press. 111-134.

[140] Cooper, J., & Weaver, K. D. (2003). Gender and computers: Understanding the digital divide. Psychology Press. 20-25, for an overview of findings from: Cooper J., Hall J., & Huff C. (1990). Situational stress as a consequence of sex-stereotyped software. Personality and Social Psychology Bulletin, 16(3), 419-429.Light, P., Littleton, K., Bale, S., Joiner, R., & Messer, D. (2000). Gender and social comparison effects in computer-based problem solving. *Learning and Instruction*, 10(6), 483-496. Light, P. (1997). Computers for learning: Psychological perspectives. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 38, 497-504. Littleton, K., & Bannert, M. (1999). Situating differences: The case of gender and computer technology. In J. Bliss, R. Säljö, & P. Light (Eds.), *Advances in learning and instruction series* (171-182). Amsterdam: Pergamon. Littleton, K., & Hoyles, C. (2002). The gendering of information technology. In N. Yelland, & A. Rubin (Eds.), *Ghosts in the machine: Women's voices in research with* (pp. 3-32). Peter Lang. Littleton, K., Light P., Joiner R., Messer D., & Barnes P. (1998). Gender, task scenarios and children's computer-based problem solving. *Educational Psychology*, 18(3), 327-340.

[141] Laurel, B. & Lunenfeld, P. (2003). *Design Research: Methods and Perspectives*. MIT Press, 2003. Laurel, B. (2001). *Utopian Entrepreneur*. MIT Press. Laurel, B. (1998) An Interview with Brenda Laurel. (Purple Moon) In Cassell J. & Jenkins H. (Eds.) From Barbie to Mortal Kombat: Gender and Computer Games (P. 118-135). MIT Press. Laurel, B. (1990) *The Art of Human Computer Interface Design*. Addison-Wesley Publishing Company, 1990.

curricular activities for children ages 5-18, Laurel provides some heuristics for designing children's digital content.[142]

2.3.4.4.1 Strategic Design Research, but Only if Under-the-Radar

One of the most interesting sections of Laurel's report is the "Industry Practice" portion describing how design research was undertaken at the now defunct Atari:

> *"Atari's market research group was devoted to the traditional purpose of figuring out how to market product and not to determine what product should be created. This latter function fell informally to my group, as there was no institutional recognition of the need for such a function at all…*
>
> *Our group had three research goals:*
>
> *1. Determine which videogames and arcade games to port to or develop for the home computer. We achieved this goal in three ways. First, we gathered sales figures for videogames and rankings for arcade games (quantitative data). Second, we worked with engineers to determine which games could successfully be ported to the home computer architecture (expert interviews). Third, we observed kids playing games in arcades to identify attractive game characteristics (observational ethnography). This last function basically consisted of me going around to arcades, watching kids, and asking questions.* ***These research activities were organizationally unsupported and invisible to the company****.*
>
> *2. Identify non-game applications that would add value to the home computer its general audience. Our methods here were fundamentally speculative and occasionally formal. We looked at areas of existing practice (e.g., financial management, self-improvement, education) and applied formal criteria to determine which of these practices might be enhanced through computer software. This analysis gave rise to such products as a word processor, an early spreadsheet program, a personal financial management program, and the PILOT programming language for kids.* ***It should be noted that we were forced to make broadly speculative decisions about the makeup of our audience and to deduce its needs from existing activities and media*** *(e.g., books, magazines, television, etc.).*

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[142] Laurel, B. (2004). *Design Research, Practice, and Principles For Digital Kids. Exploratorium/MacArthur Foundation*. http://www.exploratorium.edu/research/digitalkids/Laurel_DigitalKids.pdf (retrieved on Oct. 15, 2011) Laurel, B. (2014). *Computers as Theatre*. Pearson Education.

3. Develop criteria for usability. Through fundamentally formal analysis, the group developed the first "Human Factors Checklist" in the personal computer industry. ***Again, this work was unsupported by the organization and not officially part of the charter of our group or any other****.*

The group performed all of these research activities "under the radar" of the organization because the need for them was not acknowledged and utilizing resources on them was seen as wasteful and inappropriate*. This, in a nutshell, was the process in every computer game and software company with which I was subsequently involved, including Activision, Epyx, and LucasArts Interactive.*

My conclusion is that when a type of product is deemed successful, its form and derivation (in the case of videogames, this was often based on licensing of successful film properties) become the de facto criteria for future product design. ***Conscientious engineers, designers, and marketers conduct stealth research by ad hoc means to do what they know should be done within organizational contexts that do not support their activities or acknowledge the need for research except in relation to marketing and advertising.*** *Play testing and quality assurance are sanctioned ex post facto forms of research that are generally aimed at validation rather than innovation." (Laurel 2004, p 7-8) (my emphasis in bold)*

Design research in the service of **post-production marketing**, is still a recurring problem in the industry, and points to management's incomprehension of design as a strategic activity. (Borja de Mozota 2001)[143]

After describing her research at Apple and Interval Research, Laurel concludes with her experience as the founder of the pioneering girl game company, Purple Moon. In that capacity, she describes her dealings with Sega of America, Sony, Hasbro and Mattel:

"In 1995-6, Sega had an internal project devoted to exploring the market potential for games for females and families. It was observed that ***during school hours, up to 70% of the calls to the Sega help center were from adult women – presumably, moms playing games while their sons were at school****. This tempted Sega to explore a new market opportunity. I learned from internal sources at Sega that the project was terminated for an interesting reason.* ***Upper management at Sega determined that, were the company to be seen to be***

[143] Borja de Mozota, B. (2001). *Design Management*. Editions Organizations, collection Les Références.

developing games for female audiences, their brand equity with their core male demographic would be significantly eroded*. They were right. A potentially successful solution would have been to develop a separate label that distanced female-oriented games from the Sega brand, but this approach was deemed to be too expensive and the initiative was discarded. Boxes of questionnaires that supported the hypothesis that female-oriented games were desired by significant numbers of girls and women were destroyed.*

After I became actively involved in carving out a new computer game category aimed at a female audience by conducting extensive quantitative and qualitative research, I became known as an expert in that arena. It is in that capacity that I encountered Sony. I was hired for ***one day to present findings from my research to Sony in an attempt to educate their game designers about reaching a female audience****. The session was poorly attended and the attendees, with one or two exceptions, made it clear by their demeanor that they were attending only because they had been required to do so. No design work was initiated or influenced as a result of this seminar to my knowledge, but* ***the company probably concluded that they had done due diligence on the opportunity****.*

… At Mattel, it became apparent that the company's interest was in perpetuating the Barbie line of software products. The company's interest in Purple Moon was focused on having a line of products that Barbie players could "graduate" to. In the end, Mattel acquired American Girl to fulfill this need. The ***company then proceeded to acquire all other labels in the "girl game space" (including Purple Moon) and then to kill those competing brands.*** *This play, which* ***cost the company in excess of $700M,*** *effectively destroyed … the software organization that was in place;* ***after the spate of acquisitions, there was not enough money left to service the existing brands****. At Hasbro,* ***the girl audience was judged to be too much of a reach for a boy-branded company.*** *In both cases, the "industry practice" was to look at existing brand equity with known audiences and to make strategic marketing decisions about entering the space. While both Mattel and Hasbro do extensive play-testing on their toy products,* ***design research does not appear to drive product decisions****." (Laurel 2004, p 10-11) (my emphasis in bold)*

2.3.4.5 Design Heuristics for Children's Interactive Experiences

In the rest of the report, Brenda Laurel provides design heuristics for the design of interactive media for young people, with special emphasis on the objective of informal learning. I'm including most of them here. In the first section are general recommendations from Cheskin, the design research firm that Laurel worked with.

2.3.4.5.1 Cheskin's General Heuristics for Interactive Experiences for Youth (2002)[144]

- *"create a sense of fun and spontaneity*
- *provide personalization*
- *incorporate fashion elements into design*
- *promote connectivity — make it mobile*
- *include creative tools (i.e., create custom music/movies, clothing, etc.)" (Laurel 2004 p14)*

Cheskin's recommendations are common sense verging on platitudes, but Brenda Laurel mentions these addendums to Cheskin's (2002) report, which seem a bit less generic and more relevant to fostering interesting interactive experiences.

- *"establish personal relevance*
- *incorporate existing social practice*
- *connect to popular culture*
- *create affordances for fan activity*
- *allow for significant interaction*
- *provide for transgressive play*
- *avoid serious consequences" (Laurel 2004 p17)*

2.3.4.5.2 Laurel's Design Heuristics for Millennials

According to Laurel, millennials (or Generation Y), born in the 1980's to late 1990's, are considered a generation apart from the rest, and Laurel makes this set of heuristics that quite obviously should apply to everyone, not just millenials.

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[144] Cheskin Research Report (2002) Designing Digital Experiences for Youth.

- *"provide for collaboration*
- *support multiple communities*
- *facilitate user-created media*
- *avoid outdated stereotypes based on gender, race or culture*
- *optimize for positive social interaction" (Laurel p 19)*

2.3.4.5.3 Laurel's Design Principles Related to Gender

Laurel mentions she studied primate behavior quite intensely (Laurel & Lunefeld, 2003) and makes reference to biologically determinist researchers like Kimura (1992). This implies a deep–rooted belief in biological sex differences and makes her essentialist statements on brain-based differences particularly troubling[145]. Laurel's gender design heuristics tread a very fine line between gender-essentialist statements and disclaimers such as the introduction below.

"The following principles take the form of statements of difference. As with all of the heuristics and principles in this section, these are based on averages. Especially in the realm of gender difference, by many social and biological measures, the distance between the peaks of the bell curves for boys and girls are closer together than the ends of the individual curve for either gender—in other words, the average girl and the average boy have more in common than the girls or boys at opposite ends of the curve... Given that caveat, the reader may find some value in these general statements of difference. They can be used to tailor products for boys, for girls, or for both groups." (Laurel 2004, p 20-21)

Laurel's Technology and Computer Games heuristics then proceed into what seems like essentialist recommendations. While she studied thousands of American children in the

[145] Laurel's heuristics of brain-based differences, based on Kimura (1992) which I have chosen to omit: α.) Girls tend to perform less well than boys in activities involving mental rotation when under time pressure. When time pressure is not a factor, performance tends to equalize. b.) Girls tend to rely more than boys on landmarks for navigation. c.) Girls tend to navigate in more body-centric ways than boys.

1990s, kids are products of a gendered milieu, and they display tremendous gender conformity in the 8-12 age range. Therefore, her gender-based design heuristics are tantamount to gender stereotypes.

Technology

- *Girls and boys tend to feel that game consoles are for boys while computers and mobile devices are for everybody. (Laurel, 2004, p 21)*

Computer Games

- *Boys place high value on speed and action, while girls place high value on character and story.*
- *Boys tend to like "superhero" characters, while girls tend to like characters with whom they can identify (another way to say this is, somebody I might have a conversation with). Note that Anime and Manga forms, currently in vogue with teen and tween girls, tend to have superhero-type characters; however, the characters are typically kids as opposed to the adult Marvel-type hero.*
- *Boys value winning or having achieved a high score, while girls tend to value exploration and experience.*
- *Boys will typically tolerate steeper and longer learning curves than girls. Girls tend to need quick feedback and the ability to "do something" in a game in order to stay engaged. (Laurel, 2004, p 21)*

Social Relationships and Social Status

- *In same-sex peer groups, boys tend to establish social status through explicit competition with direct measures (e.g., sports, special expertise).*
- *In same-sex peer groups, girls tend to establish social status through affiliation and exclusion. Competition, while present, tends to be covert. (Laurel, 2004, p 22-3)*

Differences Related to Play

- *Both boys and girls use both social methods, but overt competition tends to be judged negatively by girls, while boys tend to find the webs of affiliation and exclusion to be bewilderingly complex.*

- *Both boys and girls favor constructive play; however, boys' constructive play tends to be more physical and girls' constructive play tends to be more narrative.*
- *Forms of play are likely to be gendered. (Laurel, 2004, p 23)*

Once again, Laurel's design heuristics result from her extensive study and focuses on average behavior and preferences which blurs the boundaries with gender essentialization and stereotypes. However, this does not invalidate her findings, particularly on the finer points of competition and constructive play. In my conclusion (sec. 7.7), I propose design heuristics for gender-neutral children's digital experiences.

2.4 Issues and Debates

Section 2.4 explores contested issues within gender, design and technology as they relate to this research. Gender as a politicized subject position (2.4.1) and the different feminist epistemologies (2.4.2) tease out the nuances of my feminist research subject. Design and diversity (2.4.3) explores the reasons for encouraging diversity in a design team. Diversity is automatically assumed to create more responsive products and services, but this issue is rarely explored or expanded upon in the debate on the lack of women in STEM. Since the benefits of diversity are highly contested by alt-right movements, design management research presents the benefits and complexities of diverse creative teams. Finally, the evolution of girl games (2.4.4) explains their transformation from benevolent tools to increase technical competence in the 1990s to contemporary tools of gender stereotype reification.

2.4.1 Gender: Politicized Subject Positions

Gender theory has evolved in two primary parallel tracks, each with their own social and political ramifications. The first track is the evolutionary biology point of view in which gender differences are based on hormonal, physiological and genetic differences. (Geary 1998; Kimura 1992, 2000) This view aligns itself with conservative movements that use these sex differences as reasoning for women's inferior status, and inadvertently for maintaining the status quo through belief in natural states for the two sexes, with a clear superiority in masculine ways of being and ways of seeing. In this view, men and women are "complementary" opposites, often using masculine "hardness" and feminine "softness" metaphors.

The second track is the sociological view in which gender differences are created and reinforced by and through culture in the form of strict sex and gender dichotomies. This view aligns itself with most contemporary feminist researchers, and liberal/contestation movements. It suggests that because the strict gender dichotomy is defined and maintained culturally, gender norms can be modified by creating or changing laws, but bias (stereotype belief habits) are much more difficult to modify. Social issues like slavery, feminism, racism, and homosexuality have significantly changed over the past 150 years, often through legislative action like allowing women to vote, racial desegregation or more recently, gay marriage, suggesting that not only is this change possible, it offers a possible roadmap to activists.

Evolutionary movements use statistical norms to justify their theories, without taking into consideration the significant contextual influence of raising children in a strict gender dichotomy. In the context of this research, belief in men's supposed superiority in math and cognition is considered to be an important factor in women's reluctance to enter in computer science. But male cognitive superiority is slight and says as much about what is tested and why. Factors that show no differences often remain unpublished. The brain's plasticity is influenced by the way its skills are solicited, and so the evolutionary biology viewpoint that sexes have "natural" cognitive abilities is weak methodologically because it can be manipulated by changing testing semantics and providing training.

While I did not enter this debate with any preconceived notions, evolutionary psychology research methodology continually raises red flags for their belief in neutral sex-differentiated subjects. In conclusion of my research on sex-based aptitudes for prestigious technical professions, cultural factors not only influence biological factors,

gendered socialization and belief in gender stereotypes appears to be more convincing and influential culprits to explain the dearth of women in ICT. My hypothesis now falls squarely on the side of sociological influences, in particular the gender socialization of children by parents, siblings, peers and teachers to establish belief-habits in gender stereotypes.

2.4.2 Feminism and its Different Epistemologies

While it may be tempting to think of feminism as a unified "sisterhood," we must acknowledge the different ways that feminists categorize themselves. These different positions can help clarify the multiple ways that one could look at the hegemonic "monoculture" or single-way-of-seeing that McIntosh refers to in her seminal essays on curricular revisions (1983 & 1990) examined in the previous section.

2.4.2.1 Schiebinger: Liberal Feminism versus Difference Feminism

Schiebinger (1999)[146] creates two major categories of feminism that are often put into opposition: liberal feminism and difference feminism. Both present valid arguments and blind spots.

- **Liberal Feminism** focuses on equal rights and opportunities, pay, etc. The view that women are the equals of men (in principal) is not even seen as feminism

[146] Schiebinger, L. (1999). *Has feminism changed science*? Harvard University Press.

anymore in western countries with relative gender equality and has become a common ideology in neoliberal societies. Assimilation is considered key to achieving equality, requiring women to adapt to the standards of men. While men and women are more similar than different, this ignores or denies gender differences like the professional repercussions of childbirth and parental expectations.

Liberal feminism, like Sheryl Sandberg's *Lean In* (2013), considers that little in either culture or content of sciences needs to change to accommodate women. (p 3-5.)

- **Difference Feminism** emphasizes differences not sameness between men and women. These differences are brought about through culture (but not biologically determined). Difference feminism considers that culture and content need to be modified to better accommodate women and tries to reassert feminine qualities that have been devalued:
    - subjectivity,
    - cooperation,
    - empathy,
    - feeling, and
    - other epistemologies/ways of knowing (connected knowledge, contextual thinking, and collaborative discourse rather than knowledge that privileges impersonal abstract rules and standards).

Postmodernist feminists like Butler and Haraway argue that there is no such thing as the essentialist and romanticized "universal" woman. (p 5-8)

2.4.2.1 Rosser: Feminist Theories of Women and Technology

SV Rosser (2006)[147] examines from the perspective of different feminist theories in three domains: women in the technology workforce, women as users of technology, and women and technology design. Her feminist categories are often intersectional with other social groups and political orientations.

> *"A number of feminist perspectives are considered including liberal feminism, socialist feminism, African American/womanist and racial/ethnic feminism, essentialist feminism, existentialist feminism, psychoanalytic feminism, radical feminism, postmodern feminism, postcolonial feminism, and cyberfeminism. The author hopes that examining technology and gender using the fuller range of feminist theories may uncover subtle, rich insights into the dynamics of the coevolution of gender and technology." (Rosser, 2006, p 13)*

- **Liberal Feminism** involves the belief in:
    - equal rights and opportunities and fighting unjust discrimination;
    - individualism;
    - scientific method (obtaining knowledge is both objective and value free);
    - fundamentals remain the same, but need correcting for bias.

According to Rosser's definition, male bias in science, medicine and engineering impacts women in negative ways, such as in drug trials that do not test for side-effects on women or the design of airbags that are potentially lethal to small women and children. Anne-Jorunn Berg (1999) found smart houses are about integration and centralized control of home functions, but housework is not

[147] SV Rosser (2006) Using Lenses of Feminist Theories to focus on Women and Technology (p 13-46)

considered part of its functions.[148] (P 307) Housework increased for women in first half of 20th century as they went from managers of help (i.e., family and or staff) to individuals doing manual labor aided by household appliances. Standards of cleanliness also increase, making sure women never have too much idle time. (Forty 1986, p156-181) Masculinity of engineering and its military origins make it more responsive and useful to the male sphere. (Cockburn 1983; Hacker 1981). (Rosser 2006, p15-17)

- **Socialist Feminism** take Marxist critique as it's precursor, reject individualism and believe that all knowledge including science is socially constructed and emerges from practical human involvement in production (p 17) For Socialist Feminists knowledge cannot be objective or value free. Capitalism, the prevailing mode of production, and patriarchy are mutually reinforcing and favors the interests of the dominant social groups. Social class and gender are on equal footing and result in wage discrepancy and less educational access. Reproduction and childrearing are uncounted productivity in capitalism and reinforce the patriarchy. (Mackenzie & Wajcman 1985)[149] Women's electronics assembly jobs are the worst paid, most tedious and health-destroying toxic segments of the technological sector and are not counted in women in ICT statistics. (Fuentes & Ehrenreich 1983)[150] Men dominate new technology because their availability to work long hours, geographic mobility, and

[148] Berg, A.J. (1999) A gendered socio-technical construction: the smart house. In Mackenzie D. & Wajcman, J. (Eds.) *The Social Shaping of Technology* (1999), pp. 301-313. Forty, A. (1986) *Objects of Desire: Design and Society Since 1750.* Thames and Hudson.

[149] MacKenzie, D., & Wajcman, J. (1999). *The social shaping of technology*. Open university press.

[150] Fuentes, A., & Ehrenreich, B. (1983). *Women in the global factory* (Vol. 160, No. 1). South End Press.

access to venture capital may be as important as technological skills for the success of start-ups. Capitalists decide what gets funded and developed. Socialist feminists criticize the use of public money for private corporate research and development and the protection of private interests and want instead a redistribution of resources and control to help the disenfranchised and the masses. (p 17-20).

- **Racial/Ethnic Feminism** (Intersectional) is like socialist feminism in that it is anti-individualist and points to the fact that engineering is pursed by less Hispanic and African Americans, 2.5-3%, even though these social groups comprise 22.4 % of US population (NSF 1999). They would also point to similar racial bias in design that affect women. Intersectionality (Crenshaw 1989/2018)[151] comes into play as a compounding factor of gender and ethnic origins. (p 20-21)
- **Essentialist Feminism** (eco-feminism) takes the position that all women are united by their biology, extended to secondary characteristics, like visio-spatial ability, aggression, and prenatal/pubertal hormone exposure, often serving as essentialist arguments for the absence of women in STEM. (Benbow & Julian 1980, Wilson 1975, Trivers 1972, Dawkins & Carlisle 1976, Kimura 2000) While Cockburn (1983) and Wajcman (1991)[152] address aggressive and hostile tendencies in STEM as a turn-off for women, essentialist feminists attribute this to men's testosterone levels. Women by their ability to give birth are less inclined to try to control and exploit nature; giving birth makes them closer to nature. Men compensate for

[151] Crenshaw, K. (2018). Demarginalizing the intersection of race and sex: A Black feminist critique of antidiscrimination doctrine, feminist theory, and antiracist politics [1989]. In *Feminist legal theory* (pp. 57-80). Routledge.

[152] Wajcman, J. (1991). *Feminism confronts technology*. Penn State Press.

their inability to give birth by birthing science and technology. Difference rooted in biology can be used to justify superiority or inferiority, a tool for conservatives to keep women in the homes. Eco-feminism suggests that women would design and use technology differently and have a more symbiotic relation with natural resources. (p 21-23)

- **Existentialist Feminism** claims that it's not the biological differences, but the value that society attributes to these differences that has made women "the Other." It is man's conception of women as Other (Beauvoir 1948) that has led to domination and exploitation. Men design the technology that women use. (Tabet 1979, 1982) Men who have less childcare responsibilities can spend more time coding and do not notice the absence of women in a world made for those 'with spare time'. Gender bias in design means that when designing cockpits for 5-95th percentile of males, only the 60-90th percentile of female are covered. This remains a "best practice" even if the design process knowingly excludes women due to size or strength. (p 25)
- **Psychoanalytic Feminism** frames the Freudian anatomy as destiny. (Chodorow 1978)[153] "Object relations theory" in the construction of gender and sexuality in childhood results in male dominance because of female care-taking roles. Objectivity and rationality in science are synonymous with the male approach to the physical, natural world. Rationalism and abstraction lead to the absence of

[153] Chodorow, N. (1978). *The reproduction of motherhood*. Berkeley.

end-users in the design process, putting priority on data over relationships, and ignoring relationships also ignores power-differentials and domination. (p 27)

- **Radical Feminism** perceives male oppression as the first and most widespread form of oppression. Science is an effective patriarchal tool to control women. Radical feminists reject most scientific theories because they are not woman-centered, and advocate for women-only organizations. (Mackinnon 1987)[154] (p 29)
- **Postmodern Feminism** states that the values of progress and reason are no longer universal. Rather, the self is socially constructed by ideology, situated and contextual, not in a unified category of "woman" (due to differences in "race," class, age, abilities, and national and cultural identities). No single universal research agenda or application of technology will ever be appropriate, with audience reactions differing through complex identities. Postmodern feminists doubt that women have similar needs of technology or that the technology industry affect women uniformly and therefore explore the limits of seeing Women as a group. Their anti-essentialist approach can inhibit gender-based coalitions and create political inactivism. (Butler 1992). (p 33)
- **Postcolonial Feminism** observes that Postcolonialism is still intact in a first world, third world dynamic (north versus south) through exploitative relations mixed with patriarchy. Information technology allows the exploitation of a mostly low-paid third-world female workforce in global industries. (p 35)

[154] MacKinnon, C. (1987). *Feminism unmodified. Discourses on lie and law*. Cambridge. Harvard University.

- **Cyber Feminism** explores the way the Internet liberates or oppresses women (Plant 1996, Millar 1998)[155] to level the playing field because women's socially responsive conditioning makes them ideally suited for the interactive and collaborative digital workforce. In the early 1980's, statistics attest that there were up to 37% women in computer science, but then the "number of women plummeted." Did their numbers stay the same while men flocked to the discipline, diluting percentages, as Collet (2005) suggests? The rise of financial speculation by nonproductive economic investments (Millar 1998) and current IT development has resulted in reifying the existing race, gender and class lines. (p 39)

Categorizing these different feminist viewpoints can help make sense of different epistemological positions and gives consideration to different ways that hegemonic monoculture can be reinterpreted. While my sympathies lie with a number of different feminist viewpoints — more on the socialist/postmodern/cyber-feminist side due to their immediate pertinence to my research topic — I prefer to focus on what unites feminists, which is the improved socio-economic condition of women of all social groups and a leveling of the gender hierarchy beyond epistemological differences. Even though my research focuses on increasing the professional presence of relatively privileged, highly educated women in ICT, this does not dismiss the need for vigilance, action and mutual support for other feminist epistemologies and causes such as reproductive rights,

[155] Millar, M. S. (1998). *Cracking the gender code: Who rules the wired world*?. Canadian Scholars' Press. Plant, S. (1996). The virtual complexity of culture. *Future Natural: Nature/Science/Culture*. London: Routledge, 203-17. Plant, S. (1997). *Zeroes and Ones*. Doubleday.

violence, racism, homophobia, etc. In times of backlash against feminism, every social advance must be defended.[156]

2.4.3 Design and Diversity

Discussions about increasing diversity in game development teams is often declared as a self-evident truth that sexism in the game industry and its artifacts would decrease with more women in its production environment. How and why this should happen is rarely discussed.

Having sat through countless meetings with more headless, armless, nude female torsos than I could shake a stick at (presented as "generic artwork" to test our rendering engines), I was often the *only* woman in the room. To thrive in the game industry, I learned to pick my battles wisely. A sexy poster in a coder's office? Who cares. A sexy screen-saver on the CFO's computer visible while we have a meeting? I care. We were five women in a start-up of 50, and I was the only one who dared to openly complain about the sexist signals coming from above.

My mostly male, former colleagues saw nothing wrong with working on all-male development teams, even when making horse-back riding pink games for the DS. Supposedly, they didn't get qualified female candidates. It never occurred to them that female candidates had to go through multiple levels of HR before they even laid eyes on a

[156] Faludi, S. (2006). *Backlash: The undeclared war against American women*. Broadway Books.

candidate's CV. More importantly, they quietly feared that too many women would change the office culture. This is precisely why diverse teams are necessary. Because when you assume that everyone shares your goals and views, you question them less, communicate less, and become intellectually lazier.

Katherine Philips (2014)[157] has been researching the social dynamics that diversity brings to groups.

> *"Decades of research by organizational scientists, psychologists, sociologists, economists and demographers show that socially diverse groups (that is, those with a diversity of race, ethnicity, gender and sexual orientation) are more innovative than homogeneous groups. It seems obvious that a group of people with diverse individual expertise would be better than a homogeneous group at solving complex, non-routine problems. It is less obvious that social diversity should work in the same way—yet the science shows that it does. This is not only because people with different backgrounds bring new information.* ***Simply interacting with individuals who are different forces group members to prepare better, to anticipate alternative viewpoints and to expect that reaching consensus will take effort.****"* (Philips, 2014, p 43) *(my emphasis in bold)*

Breaking up the "vikings-in-a-boat" atmosphere that game developers enjoy by introducing "outsiders" is precisely the point. Making their environment *less* comfortable will perhaps enable them to avoid the pitfalls of monoculture that allows sexist and racist elements to develop unchecked and yet are invariably called out once their product is released to the public. There is something to learned from the embarrassing cases of the bikini-clad female soldier "who breathes through her skin" to "women being too difficult to animate as the excuse for having no female playable characters" (that we will examine

[157] Phillips, K. W. (2014). How diversity works. Scientific American, 311(4), 42-47.

in the Literature Review). Asking hard questions and expressing a diversity of viewpoints in the development phase might have spared everyone a lot of grief.

But how many "outsiders" are required before we achieve a critical mass that can overcome the self-moderating, anxiety producing tendency[158] that comes with tokenism? When I was the only women in the room, I know I thought long and hard before saying anything that might be construed as aggressive or negative. Rosabeth Kanter (2008) reported that workers from minority social groups experience tokenism when their social group represents less than 15% of employees.[159]

Rock, Grant and Grey (2016) found that while homogenous teams felt that their work was easier and more productive, and they felt more confident in their results, their results suffered significantly compared to diverse teams.

> *"On a homogenous team, people readily understand each other and collaboration flows smoothly, giving the sensation of progress.* ***Dealing with outsiders causes friction, which feels counterproductive****… In fact,* ***working on diverse teams produces better outcomes precisely because it's harder****…" (Rock & Al., 2016)*[160]
>
> *"…****diversity initiatives may not be successful until we do more to address the way diversity is perceived.*** *When leaders see it first and foremost as a social obligation that makes things difficult and slows progress, they will likely make decisions that undermine the organization's diversity goals. They may also, at least unconsciously, try to downplay the substance of existing diversity on their teams. If, however, leaders can recognize that the debate and unfamiliarity that come with diversity is an important catalyst for creativity and deep*

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[158] Lord, C. G., & Saenz, D. S. (1985). Memory deficits and memory surfeits: Differential cognitive consequences of tokenism for tokens and observers. *Journal of personality and social psychology*, *49*(4), 918. Zimmer, L. (1988). Tokenism and women in the workplace: The limits of gender-neutral theory. *Social problems*, *35*(1), 64-77.

[159] Kanter, R. M. (2008). *Men and women of the corporation*: New edition. Basic books.

[160] Rock, D., Grant, H., & Grey, J. (2016). Diverse teams feel less comfortable—and that's why they perform better. Harvard Business Review, 22. https://hbr.org/2016/09/diverse-teams-feel-less-comfortable-and-thats-why-they-perform-better

thinking, they will invite it and celebrate it." (my emphasis in bold)

While tech companies talk of pipeline problems and encouraging more gender diversity, Wachter-Boettcher (2017) points to homogenous design and development teams in the tech industry as their underlying strategy because a monoculture is less likely to create dissenting opinion or conflict. She argues that half-hearted diversity measure in ICT firms are mostly for public relations, something that ICT companies don't really desire — in the interest of fostering a monoculture that will be less critical of its practices. With less dissent and criticism, their industry hopes to remain *unregulated,* even if it sacrifices the quality of products and/or services.[161]

"…tech is an insular industry: a world of mostly white guys who've been told they're special—the best and brightest. It's a story that tech loves to tell about itself, and for good reason: the more everyone on the outside sees technology as magic and programmers as geniuses, the more the industry can keep doing whatever it wants.

…if tech wants to be seen as special—and therefore able to operate outside the rules—then it helps to position the people working inside tech companies as special too. And the best way to ensure that happens is to build a monoculture, where insiders bond over a shared belief in their own brilliance. That's also why you see so many ridiculous job titles floating around Silicon Valley and places like it: "rock-star" designers, "ninja" JavaScript developers, user-experience "unicorns" … Fantastical labels like these reinforce the idea that tech and design are magical: skill sets that those on the outside wouldn't understand, and could never learn."

…Take Uber: If it were perceived as a taxi service, or an auto loan financer, it would be part of an industry with existing regulations and expectations … But by being labeled "technology"—by being better known as an app you download to your phone, rather than a massively complex system of vehicles and drivers—Uber gets to change the conversation. Instead of discussing the ethics of hiring legions of drivers as "independent contractors" and then selling them high-interest subprime loans to finance the vehicles they need to do their jobs (while aggressively pursuing the driverless technologies that will take away all those jobs), you're encouraged to marvel at the seamlessness of the

[161] Wachter-Boettcher, S. (2017). *Technically wrong: sexists apps, biased algorithms and other threats of toxic tech.* WW Norton. Kindle edition.

experience as you watch a little car icon navigate the streets on its way to your location. Uber's not a taxi company. It's superpumped. It's special." (Wachter-Boettcher 2017, 173-193)

2.4.4 Girl Games from Tools for Technical Competence to Tools of Stereotype Reproduction

The Girl Games movement started 20 years ago to create video games for girls, to bridge the gendered digital divide and bring girls into the world of technology. Back then, the female game market was practically non-existent; *Barbie Fashion Designer* 1995, *MacKenzie & Co* (1995) and *Rockett's New School* 1997 helped establish a market for girl games with specialized companies such as Purple Moon and Her Interactive. The Girl Game movement grew by market driven demand. It was also assumed that girl's increased technological competence would yield better female representation in ICT production. We've seen that this has not reaped the fruit of its labor.

Women have achieved near parity as consumers of digital media (ESA 2014)[162]; they go online as much as men. Women buy as many video games as men but focus more attention on smartphone and online games rather than consoles. Thanks to this increase in female media consumption, the computer is losing its connotation as a "boy's toy." Consoles like the Wii can be considered gender neutral, even feminine, and accessible to seniors. Certain handheld consoles like the Nintendo DS are even considered "feminine" objects. Smartphones and tablets are considered gender neutral.

[162] (ESA 2014). "Essential Facts about the Computer and Video Game Industry"

If one types “Girl Games” into a search engine today, we are a long way from the positive girl-power social message of Rocket, McKenzie, and Nancy Drew. We could consider these “purple” games. [163] Even *Barbie Fashion Designer* (1995) encouraged girls to become tech saavy through manipulating, printing out and constructing dress patterns. Contemporary girl games, aka pink games, have devolved into consumer items that worry more about visitor traffic for advertising revenue and less about the message it sends to girls. The following screenshots were all taken on Februrary 28, 2013 within the first page screen result of Google search for the search term “girl games.” Let’s go down the rabbit hole.

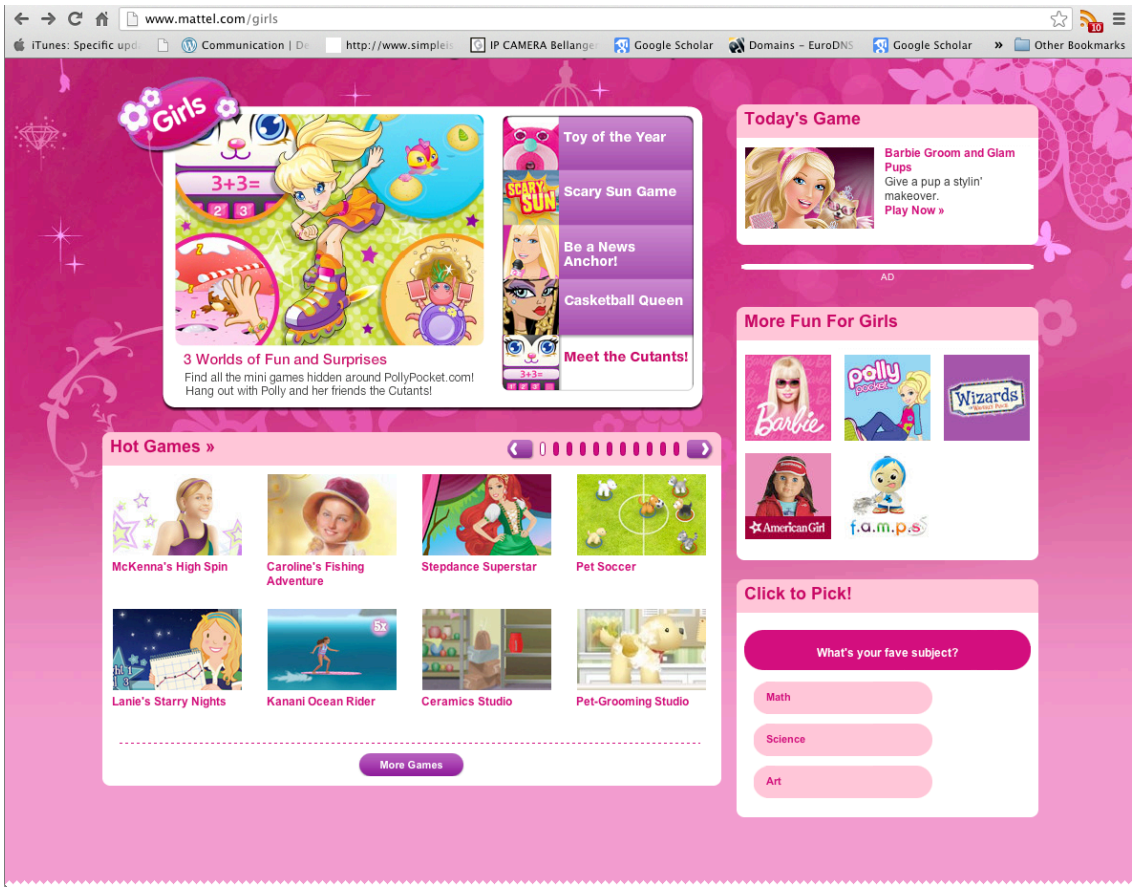

Figure 2.23 mattel.com/girls

[163] Hernandez, P. (2012) She Tried To Make Good Video Games For Girls, Whatever That Meant. *Kotaku*. https://kotaku.com/5913019/she-tried-to-make-good-video-games-for-girls-whatever-that-meant (Retrieved May 30, 2012)

Figure 2.24 barbie.com/activities/fun_games/#whats-hot

Figure 2.25 icanbe.barbie.com/en_US/games/data-diva.html – under Arcade category, "coding" as match 3 game

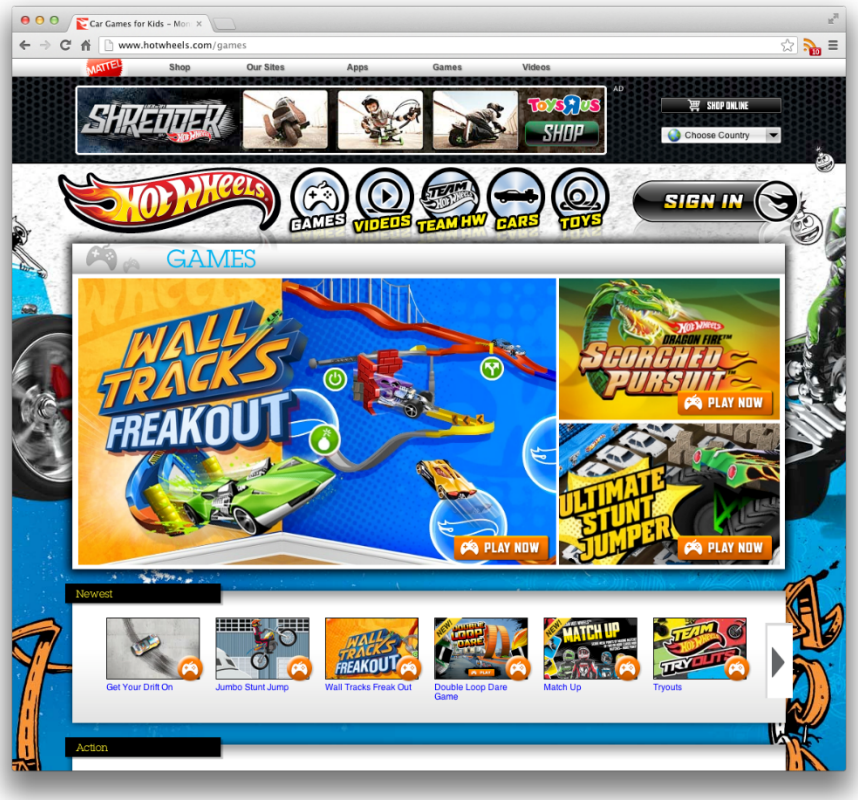

Figure 2.26 pollypockets.com for girls versus hotwheels.com for boys

If we look at the Figure 2.23-26, we are dealing with physical toy brands that extend their licensing to the digital domain. Their strongly gendered physical presence, i.e., the pink and blue aisles in toy stores that many parents decry[164], are simply translated to their website. Sweet (2013 & 2014) analyzed variations in gender and toys through a systematic analysis of toy catalogs over the 20th Century and found that toys are more gendered now than they were fifty years ago.[165] She explains toy's counter-current gendering in the age of women's liberation as a backlash against social progress by reinforcing gender norms.

The barbie.com game categories set the stage for girls' social expectancies: what's hot, princess & fairy, fashion, pets, arcade, and sporty. The feminist critiques against appearance-based games seemed to have yielded a slight reduction of make-up and hairstyle games, but the importance of pet care-taking and creative/consumerist activities continue unabated.

I included the Barbie *I can Be a Computer Engineer* online game (Fig. 2.25) that explains "coding" as a match 3 game. While this may not be the ideal moment for the complexities of programming, the game flagrantly dumbs down the logic needed to "make the puppy

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[164] Schofield, J. W. (2005). Toys for boys and girls. The Guardian-Online Supplement, 10th February, 23–24. Fine, C., & Rush, E. (2016). "Why does all the girls have to buy pink stuff?" The ethics and science of the gendered toy marketing debate. *Journal of Business Ethics*, 1-16. Blakemore, J. E. O., & Centers, R. E. (2005). Characteristics of boys' and girls' toys. *Sex Roles*, 53(9-10), 619-633.

[165] Sweet, E. (2013). *Boy builders and pink princesses: Gender, toys, and inequality over the twentieth century.* Dissertation. University of California Davis.
Sweet, E. (2014). Toys are more divided by gender now than they were 50 years ago. *The Atlantic*, 9, 2014. https://www.theatlantic.com/business/archive/2014/12/toys-are-more-divided-by-gender-now-than-they-were-50-years-ago/383556/

do tricks." Just being able to project oneself as a scientist is considered due diligence by Mattel.

Framing technology (in toys[166], games or science activities[167]) with gender stereotypes, through the use of pink and pastel colors, sparkly materials or superficial applications[168], we inadvertently reinforce the idea that serious science is a masculine pursuit, while women need their technology dressed-up in gendered aesthetic codes and subject matters meant to attract and maintain our attention — as if science was so dull and unnatural for us that we would not be interested unless we could apply it directly to our grooming habits.

Figure 2.27-29 are generic girl game websites that came up in my search. This superficial technological frame is also seen in the video games for girls that do nothing but reinforce frivolous activities as "the stuff girls are into." Fisher-Thomson (1993) found that toy manufacturers were choosing gendered colors based on *parental* expectations for toy purchasing, while girls were asking for purple, black, and silver. In other words, the manufacturer ignored the girls wishes for fear that parents would find these colors too adult. They catered to the parents' expectations instead.[169] Putting those hairstyle, makeup, wardrobe, boyfriend, pet and pony games in the hands of young girls and

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[166] https://www.amazon.com/gp/product/1223095649/ref=s9_acsd_hps_bw_c_x_1_w
GoldieBlox and The Spinning Machine

[167] https://www.amazon.com/Adams-Sparkle-Science-Glitzy-Chemistry/dp/B00ZOO1YJ8
Sparkle Science Glitzy Chemistry Set

[168] https://www.amazon.com/SentoSphere-Cosmetics-Creative-Laboratory-Perfumed/dp/B00DU055S4/ref=lp_8272757011_1_4?srs=8272757011&ie=UTF8&qid=1530346545&sr=8-4
SentoSphere Cosmetics Lab

[169] Fisher-Thompson, D. (1993). Adult toy purchases for children: Factors affecting sex-typed toy selection. *Journal of Applied Developmental Psychology*, 14(3), 385-406.

expecting them to fall in love with technology will not work if the rest of society tells them that what matters most is her appearance or how well she takes care of others. She is being groomed for consumerism, not technological passion.

As women are *finally* starting to reach the pinnacles of corporate and political success, this is the narrative that we propose to motivate girls. Be fit, be slim, and be pretty. Pay attention to your clothes, your hair, and your make-up. Get your validation from taking care of others, like pets and boyfriends. And regarding boyfriends, practice your first date, first kiss and plan your wedding. The narrowness of the feminine frame we propose for young girls is disheartening. We do not propose to girls to project themselves into a future where they could be CEOs or superheroes; we give them passive aspirational figures like princesses. Resistance is building. Buried in Figure 2.27, among the cooking and make-over games, is an eye-surgery game.

Figure 2.27 girlsgogames.com

Cassel & Jenkins (1998) caution against dismissing stereotypical female interests when participating in female culture could be considered an act of resistance to the patriarchy.[170] I would counter that most girls 8-12 years old are not aware of the patriarchial system that sets the rules and standards that they must adapt to, and that playing against the system by adopting its values that seeks to keep girls focused on superficial details is not the best strategy to enable change in the status quo.

Difference feminists might argue that I am disparaging feminine aesthetics and socially important care-taking roles. I am not. Care-taking is something we should be encouraging in boys as in girls. There is nothing wrong with "cuteness," sparkles, or pastel colors. My

[170] Cassell, J. & Jenkins, H. (1998). Chess for girls? Feminism and computer games. In G. Cassell & H. Jenkins (Eds), *From Barbie to Mortal Kombat: gender and computer games* (pp. 2–45). MIT Press.

objection is to their use in a semiosis meant to attract the attention of girls and women and that, at the same time, reinforces retrograde gender ideologies that undermine female social advances.

Figure 2.28 kibagames.com, the girl game category

Figure 2.29 girlgames.com

2.5 Geographic Perimeter

Women's declining ICT participation has been observed in pretty much every anglo-saxon or western European nation. While statistics in Asia and former Soviet block countries may differ, I choose to focus on the countries that dominate the video game production sector because these countries have the most prestigious, competitive and lucrative ICT sectors: United States, Canada, Japan, the UK and France. Oddly enough, countries like the United States have relatively high gender equality and some of the weakest female ICT participation rates, but as Dr. Collet (2006) noted in her research on French engineering schools, it may be less the disappearance of women from ICT education than the huge influx of men that is reducing the percentage of women to the point of making them practically invisible. However Dr Collet's approach has been impossible to confirm in the US diversity statistics published by the various institutions. Perhaps men are precisely drawn to ICT because the computer programmer has supplanted the machine creator as the most hallowed, lucrative and strategic engineering profession since the late 20th century. This shift in engineering prestige from hardware to software was also accompanied by two domestic technological innovations in the 1980s: the personal computer and home video game consoles. Both the PC and video game console increase technology's association with a new type of masculinity - one associated with high levels of technical competence and passion - that culminates in the stereotype of the hacker, the geek, and the gamer.

The source material studied for this dissertation takes advantage of my bilingualism in French and English. While France has a large, well-established feminist community, striving for greater gender diversity in ICT professions is still primarily a concern of Anglo-

Saxon countries, therefore a key factor for writing this dissertation in English. 80% of researchers publishing similar topics are based in the US (57%), Canada (5%), the U.K. (14%) and Australia (3.5%). Scandinavian countries with strong gender equality and English skills are mysteriously absent from the Anglo-Saxon networks (<1%).

These Anglo-Saxon feminist research networks revolve around professional organizations like International Game Developer's Association (IGDA) and the *From Barbie To Mortal Combat: Gender and Computer Games* series of conferences (1996 & 2006) and publications (1998 & 2008). The peer reviewed journals with the most pertinent articles are *Sex Roles*, published since 1975 by Springer in the U.S., and the *International Journal of Gender, Science and Technology*, published since 2009 by the Open University in the U.K.

Francophone countries have a burgeoning game studies network and feminist prerogatives are making inroads. However, aside from Isabelle Collet, very few French researchers are specifically looking to increase gender diversity in software development. French networks revolve around Paris, Lyon and Geneva, with strong links between researchers in France (12%) and Switzerland (3%) as manifested in *Genre et Jeux Vidéos* (2015), edited by Fanny Lignon. Germany (1%) and Italy (1%) round out the European contingent.

Apart from Japan, whose absence from feminist technology research circles is highly regrettable, North America and Europe are also the leading video game development countries, so it is perhaps normal that concern about gender diversity in game development teams originates there. More details can be found in the Mapping Researchers section (3.1.5) of the Literature Review.

3. Literature Review

3.1 Methodology

Literature reviews focus on research outcomes and theories. According to Randolph (2009), its purpose is to show the author's command of a subject, its vocabulary, theories, concepts, key variables, methods, and history. A literature review helps the author delimit the research problem, seek new lines of inquiry, avoid fruitless approaches, gain methodological insights, identify recommendations for further research, and seek support for grounded theory. (p.2)

Hart (1988) adds the following reasons for reviewing literature, including: distinguishing what has been done from what needs to be done, discovering important variables relevant to the topic, synthesizing and gaining new perspective, identifying relationships between ideas and practices, acquiring subject vocabulary, understanding the structure of the subject, relating ideas and theory to applications, identifying the main methodologies and research techniques that have been used, and placing the research in a historical context to demonstrate familiarity with state-of-the-art development. (p. 27) The goal is to critically analyze previous research, identify central issues and explain arguments within a field.

This literature review process will be comprised of:

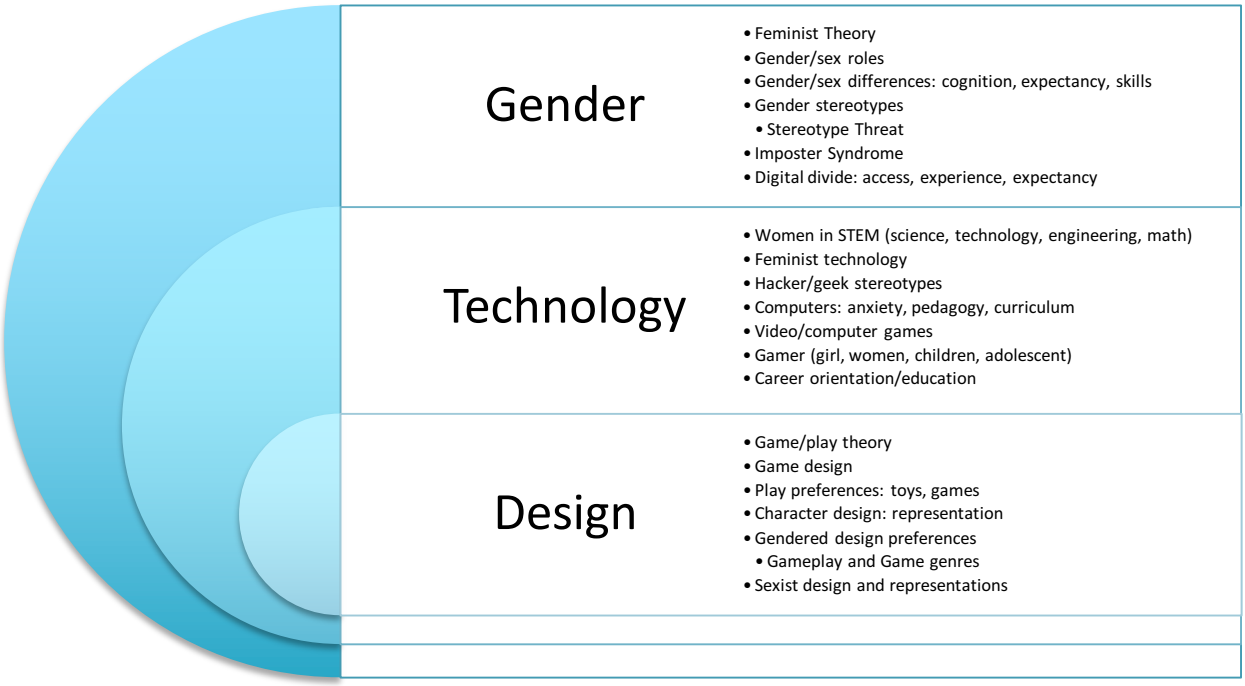
- Keywords used to initiate the search.
- Quantitative meta-analysis to show the diachronic evolution of publications by proximity to my research subject.

- Qualitative meta-analysis showing the evolution of relevant research concepts in the network of stakeholders.
- An analysis of the researchers and networks
- Conceptual map of gender and video games research subjects

3.1.1 Keywords

The article selection approach is that of *purposive sample* in which the author examines central or pivotal articles in the field. This is because the broad, tripartite fields (i.e., gender, design and technology) would have resulted in too many references to adequately manage. The bibliography has over 1300 entries.

Using combined keyword searches in Domino, Sudoc, Abes, Theses, and Google Scholar, I identified an initial series of research articles and books on technology, design or video games for girls. Searches used the following terminology:



“Gender” and “video games” alone resulted in over 400 publications. Literature reviews and articles closest to my subject were read and coded into notebooks. Their citations were verified in Google Scholar, and new source articles were obtained.

These primary and secondary source articles were read for methods and findings, and were then coded into notebooks. Their citations were identified, cross-checked in Google Scholar, and an extended set of new authors and articles were identified.

Once the process was completed in English in three iterations, it was repeated with French keywords: *Genre*, *jeux vidéo, jeux ordinateur, informatique, le jeu, feminist, feminism, stéréotype de genre, stéréotype sexuel, outils, joueuse, gameuse, orientation professionnelle,* and *formation.*

By third and fourth iteration, prominent authors reappear in numerous articles, often referencing the same key studies. New or promising studies were identified, and a final set of publications obtained. The most relevant studies were checked for methodology and conclusions and coded into notebooks.

This iterative process identified researchers working in various disciplines - like gender studies, game studies, and computer science – as well as their research methodologies and concepts, their technical vocabulary, primary publications and networks dealing with similar issues, competing theories, and other variables affecting the topic.

A gender and video games conceptual map was constructed to look at the different ways that gender research is explored by positioning research subjects along the stakeholders network model according to its focus on the artifact itself, its production, dissemination, and/or reception.

3.1.2 Quantitative Meta-Analysis

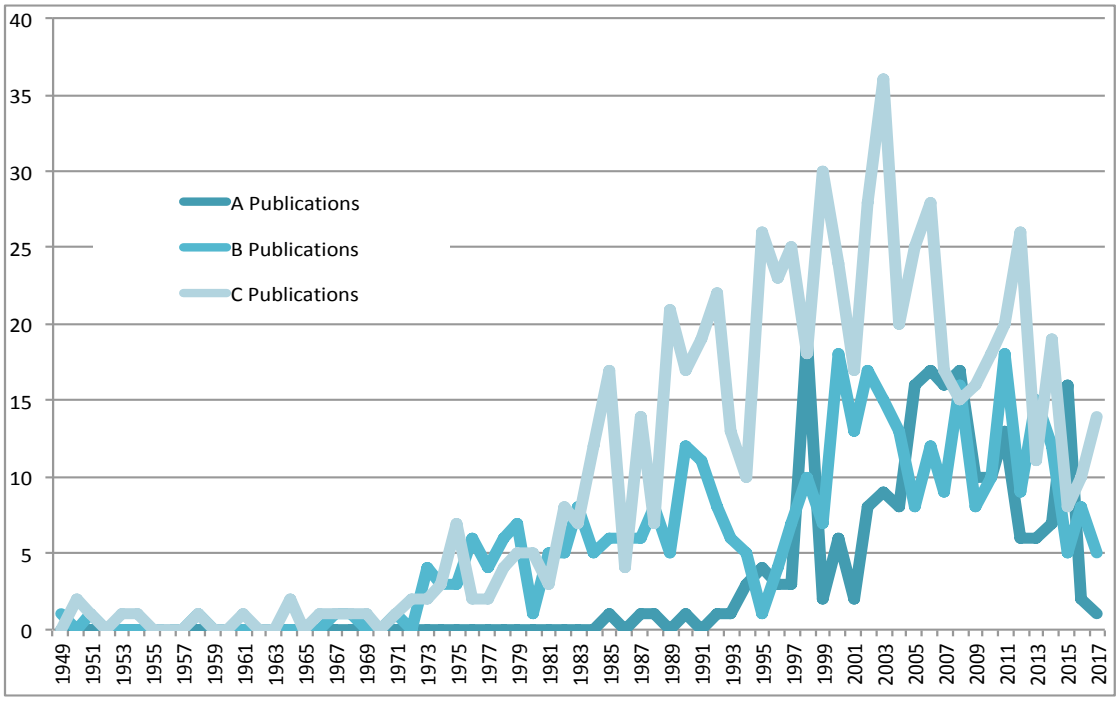


Figure 3.1 Quantitative progression of bibliographic publications by proximity to the subject.
See Appendix 9.1

	A Publications	B Publications	C Publications
1949	0	1	0
1950	0	0	2
1951	0	1	1
1952	0	0	0
1953	0	0	1
1954	0	0	1
1955	0	0	0
1956	0	0	0
1957	0	0	0
1958	0	1	1
1959	0	0	0
1960	0	0	0
1961	0	0	1
1962	0	0	0
1963	0	0	0
1964	0	0	2
1965	0	0	0
1966	0	0	1
1967	0	1	1
1968	0	1	1
1969	0	0	1
1970	0	0	0
1971	0	1	1
1972	0	0	2
1973	0	4	2
1974	0	3	3
1975	0	3	7
1976	0	6	2
1977	0	4	2
1978	0	6	4
1979	0	7	5
1980	0	1	5
1981	0	5	3
1982	0	5	8
1983	0	8	7
1984	0	5	12
1985	1	6	17
1986	0	6	4
1987	1	6	14
1988	1	8	7
1989	0	5	21
1990	1	12	17
1991	0	11	19
1992	1	8	22
1993	1	6	13
1994	3	5	10
1995	4	1	26
1996	3	4	23
1997	3	7	25
1998	19	10	18
1999	2	7	30
2000	6	18	24
2001	2	13	17
2002	8	17	28
2003	9	15	36
2004	8	13	20
2005	16	8	25
2006	17	12	28
2007	16	9	17
2008	17	16	15
2009	10	8	16
2010	10	10	18
2011	13	18	20
2012	6	9	26
2013	6	15	11
2014	7	12	19
2015	16	5	8
2016	2	8	10
2017	1	5	14
TOTAL	210	376	694

Figure 3.2: Bibliographic entries by A- C proximity

Gender, design and technology have roots going back to the 18th or 19th century, however, since my research is on transdisciplinary theoretical applications, the publications referred to here remain squarely rooted in the late 20th and early 21st century. They are sorted into a three-tiered hierarchy by proximity to subject: A-level publications (210) involve 3 or more keywords; B-level publications involve 2 keywords (376); and C-level publications (694) involve one keyword and are often reference and source articles with foundational theories within each discipline.

The first A level publication dealing with gender and video games referred to here appears in 1985, the year that female computer science undergrad enrollment reached its peak of 37%[171]. 1985 was also the year Nintendo released its FamiCOM/NES system, 61.9 million units sold, and two years after the Atari market crash of 1983 whose downfall had been caused by a glut of poor quality games. Atari was gender-neutral in its marketing to couples (arcades) and families (consoles such as the 2600 with 30 million units sold), but Nintendo was able to revive the market for video games by marketing its consoles as boy toys. Lien (2013) identifies this marketing decision as the start of gendering the video game market towards young males.[172]

Most A-level publications occur in the late 1990s, after video and computer games finally achieve mass-market success thanks to phenomenal home and handheld game

[171] See Fig. 2.2

[172] Lien, T. (2013). No Girls Allowed: Unraveling the story behind the stereotype of videogames being for boys. Polygon.

console sales by a handful of American (Atari and Microsoft) and Japanese (Sega, Nintendo and Sony) manufacturers as shown in Figure 3.3.

Year	Manufacturer	Console	Units sold in millions	Type
1977-83	Atari	2600	30,0	home
1985	Nintendo	FamiCOM/ NES	61,9	home
1988	Sega	Mega Drive/Genesis	40,0	home
1989-90	Nintendo	Game Boy	118,7	handheld
1990	Nintendo	Super NES	41,9	home
1994-5	Sony	PlayStation	102,4	home
1996	Nintendo	64	32,9	home
1998-9	Sega	Dreamcast	9,1	home
2000	Sony	PlayStation 2	155,0	home
2001	Nintendo	Game Boy Advanced	81,5	handheld
2001-2	Microsoft	Xbox	24,0	home
2001	Nintendo	Gamecube	21,7	home
2004	Nintendo	DS	154,0	handheld
2004-5	Sony	PlayStation Portable	82,0	handheld
2005	*Microsoft*	*Xbox 360*	*84,7*	*home*
2006	*Sony*	*PlayStation 3*	*85,9*	*home*
2006	*Nintendo*	*Wii*	*101,6*	*home*
2011	*Nintendo*	*3DS*	*72,0*	*handheld*
2011-2	Sony	PS Vita	15,9	handheld
2013-4	*Microsoft*	*Xbox One*	*34,0*	*home*
2013-4	*Sony*	*PlayStation 4*	*70,6*	*home*
2017	*Nintendo*	*Switch*	*17,8*	*home/handheld*
Still on the market at time of writing in early 2018				

Figure 3.3 Dominant video game consoles 1977-2017 [173]

These figures do not even begin to take into account video game sales, whose consumer spending is estimated to be three times the spending on hardware[174]. In

[173] https://www.statista.com/statistics/276768/global-unit-sales-of-video-game-consoles/; Forster, W. (2005). The Encyclopedia of Game Machines - Consoles, handheld & home computers 1972–2005. Gameplan.

the mid 1990's, research into the digital gender divide and decreasing number of women in STEM that has alarmed feminist researchers for the past decade finally begins to focus on its alleged entry point or gateway drug: computer/video games.

A-level publication peaks are associated with conferences and books dealing with gender and video games. The first peak occurs in 1998 with the conference and publication *From Barbie to Mortal Kombat: Gender and Computer Games,* edited by Justine Cassel (MIT, now Carnegie Mellon) and Henri Jenkins (MIT, now University of Southern California). The following peak occurs in 2008 with *Beyond Barbie and Mortal Kombat*, edited by Yasmin Kafai (University of Pennsylvania, now UCLA), Carrie Heeter (Michigan State University), Jill Denner (ETR Associates) and Jennifer Y. Sun (Numedeon). In 2011, two publications on gender and video game design were issued: the French publication *Cahier du Jeu video #4, Girl Power*, edited by Sandra Rieunier-Duval (game designer, Lexis Numerique), and the publication *International Journal of Gender, Science and Technology: Game Design issue*, edited by Clem Herman (Open University, U.K.). The final peak occurs in 2015 with a French publication, *Genre et Jeux Vidéo*, edited by Fanny Lignon (Université de Lyon).

B-level publications achieve critical mass at the height of the second wave feminist movement in the 1970s, 1980s, and 1990s. Key feminist scholars – i.e., Bem, Deaux, Eagly, Caplan, Maccoby, Jacklin, Bandura, Eccles, Hyde, Talbot, Cockburn, Fausto-Sterling, Cooper, Wajcman, Young, etc. - produce seminal research concerning

[174] See the ESA reports from 2010-2017 for details on U.S. consumer spending.

gender/sex role orientation and development, cognitive sex differences, gender schemas and stereotypes, and stereotype threat.

Starting with Maccoby and Jacklin in 1974, research into gender and sex differences - proving, disproving, meta-analyzing and/or contextualizing them - remains a prolific subject well into the 21st century, i.e., differences in cognition, math ability, aggression, language, anxiety, performance, achievement, and motivation. Since gender and sex differences are often used to justify gender disparity in educational and career choices, they become de facto explanations for women's absence in STEM professions, providing a fertile terrain for feminist researchers to implicate social/cultural factors rather than biological/evolutionary ones. Their inquiry usually focuses on identifying sources of inequity by pinpointing erroneous or biased assumptions or methods in previous research, by showing the negative influence of gender roles and stereotypes on "out-group" members' performance, and by demonstrating the ambiguity and often-negligible distinctions of sex differences, especially when they are in the service of justifying the status quo.

More recently, research into video game play on violent behavior (Cooper & Mackie 1986, Sherry 2001, Shibuya & Al 2008), sexist attitudes (Bègue & Al 2017), cognition (Bavelier & Green 2011), and addiction (Hoeft & Al. 2007) focus on action and first-person shooter type games that have a strong majority of male players. The results are often organized or interpreted through gendered lenses where women, non-players or light-players are interchangeable control groups. While not explicitly looking for sex differences, this research extends that corpus through its masculine artifact and gendered audience.

C publications are comprised of the seminal texts in design theory, game theory, sociology, social psychology, gender studies, statistical reports, and tertiary research in these disciplines.

This quantitative meta-analysis ignores three C-level philosophical publications prior to the first B-level publication, Simone de Beauvoir's *Second* Sex from 1949; their wide dispersion would reduce Figure 3.1's legibility. A fair number of pre-and-early-20th century misogynistic scientific essays were omitted from my bibliography, since they are well documented in Isabelle Collet's PhD dissertation (2005) and her book *L'informatique a t'il un Sex* (2006), as well as other books that trace the antipathy towards women's scientific education (Bix 2014) or women's scientific practice (Schiebinger 1991)[175]. While they would be useful to remind us of science's misogynistic foundations and the significant inroads made by feminists over the past fifty years, my research builds on their findings of previous (and continuing) gender-bias in scientific education and practice.

The three lines of chart 3.1 illustrate the majority of entries occurring in the 21st century, indicating that the issue of gender and video games (and women's absence in its production) not only remains pertinent but unresolved.

[175] Collet, I. (2005). La masculinisation des études d'informatique Savoir, Pouvoir et Genre. Sciences de l'éducation. Nanterre, Paris X. Bix, A. S. (2014). Girls Coming to Tech!: A History of American Engineering Education for Women. MIT Press. Schiebinger, L. (1991). The mind has no sex?: Women in the origins of modern science. Harvard University Press.

3.1.3 Qualitative Meta-Analysis

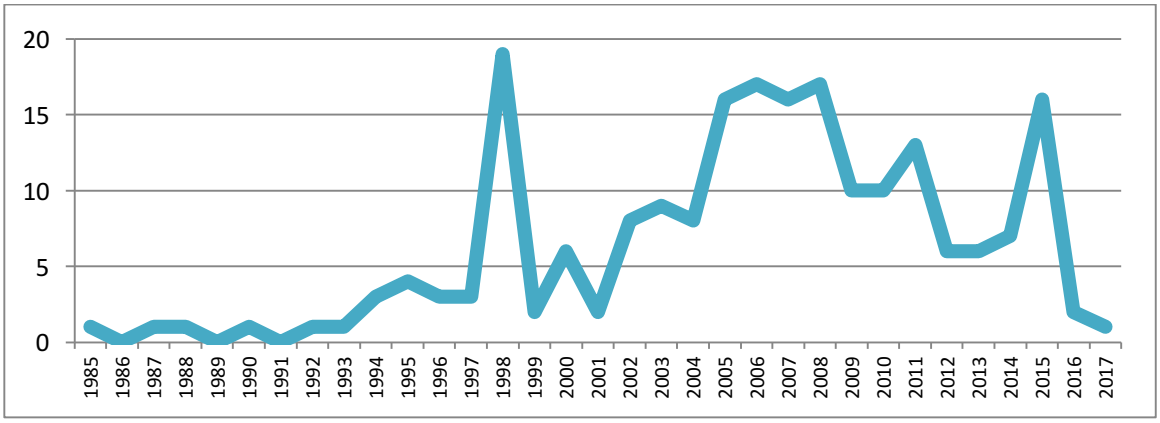


Figure 3.4 A-level publications by year: bibliographic entries with at least 3-keyword proximity to subject.

3.1.4 Conceptual Map of A Publications

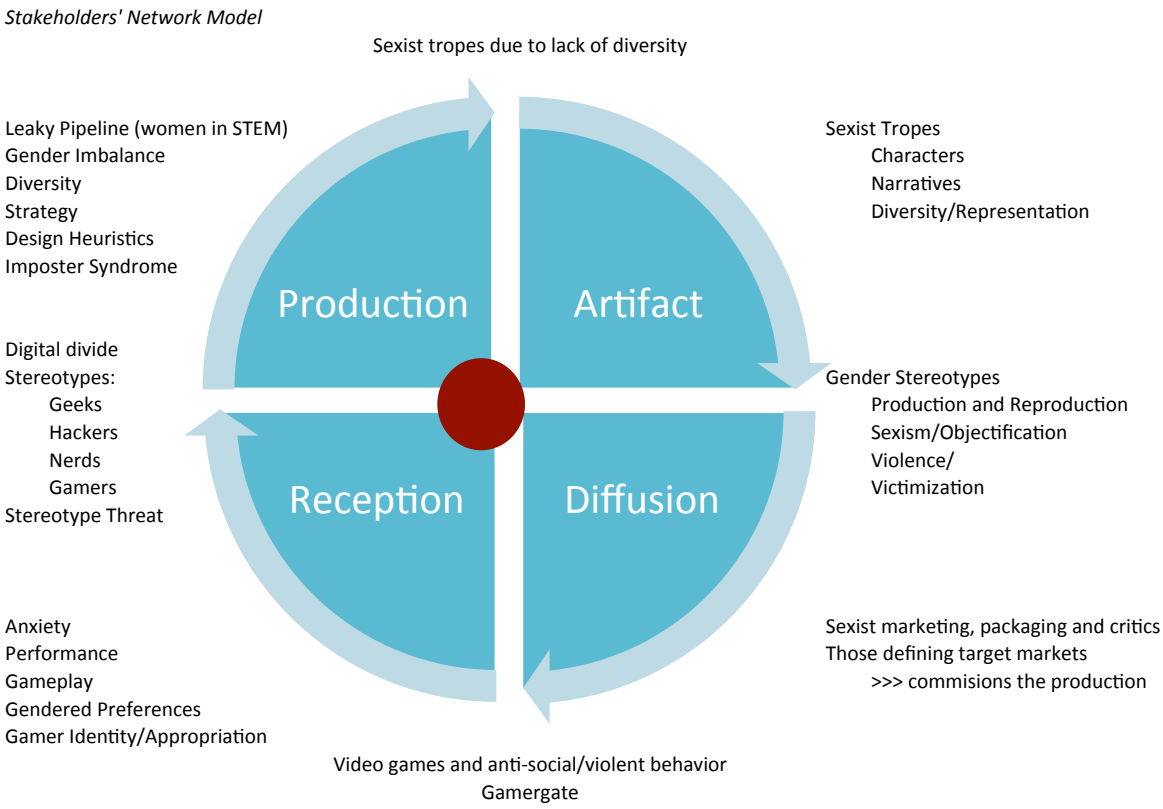


Figure 3.5 Concept Map of research on gender and video games in the stakeholder's network.
The red area is my research domain, reception and production.

Conceptual maps allow us to explore concepts through their relationships to each other. Concentrating on the 210 A-level publications listed in the appendix, early research examined more the gendered digital divide of computer access, skill and comfort rather than of video games. If we look at the A publications that deal specifically with video games and gender, the research focal point depends on which video game stakeholder is being studied: Production, Artifact, Diffusion and/or Reception (Fig. 3.5). The Stakeholder's Network Model[176] (Darras 2014, Fig. 3.6) is an ideal tool to employ because it covers all stakeholders of an artifact, its co-constructed and distributed meanings, and the evolution of habits. It separates the artifact from the network of actors involved in its production, its diffusion, and its reception; it can articulate different gender and video game research concepts with each quadrant and interstice focusing on gender and its stereotypes differently.

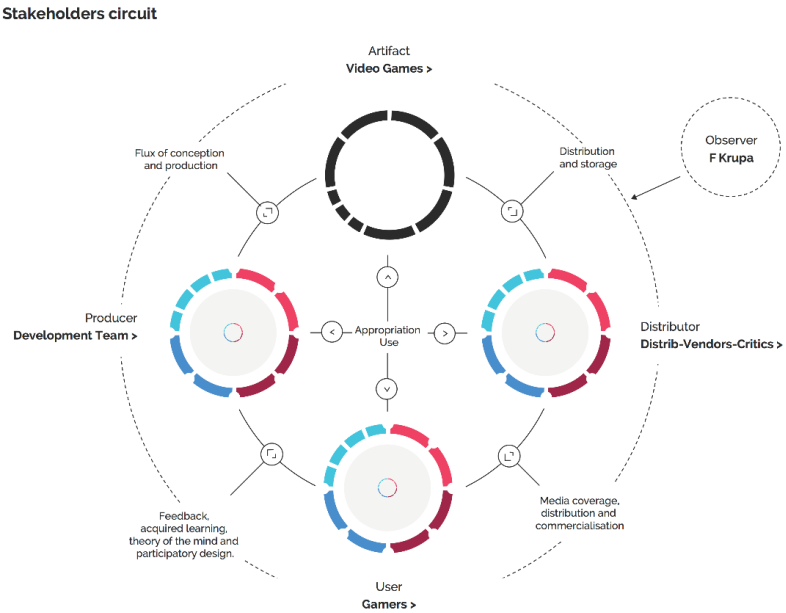


Figure 3.6 Video game's stakeholders network ©Darras & Belkhamsa http://metabolisme.design

[176] http://metabolisme.design Research tool created by the Laboratoire de Sémiotique des Arts et du Design (Institut ACTE - UMR 8218 CNRS and the Université Paris 1) and its l'Ecole Doctorale (ED 279).

3.1.4.1 Artifacts

Publications that focus on the video game as an artifact generally center on the sexist representation of women in games through gendered stereotypes that concern a character's representation and behavior, simplistic narrative and plot devices that focus on women as rewards and motivators, or lack of diversity in its characters. These articles critique the game's objectification of women and its implicit depiction of the game's universe for the Male Gaze[177] (Mulvey 1975), assuming the game's audience is male and heterosexual. Hyper-sexualized female characters and outfits, female non-player characters (NPCs) who serve only as convenient victims or providers of sexual eye candy (see Cortana in Fig. 3.7), and lack of diversity in the game characters reinforce the power asymmetry of the masculine norm and the feminine other.

Figure 3.7 Evolution of *Halo* outfits for Cortana and Master Chief
© Dustin Berg https://www.flickr.com/photos/superdunner/

[177] Mulvey, L. (1975). Visual Pleasure and Narrative Cinema. Screen, 16(3), 6-18.

3.1.4.2 Artifact & Diffusion

Publications on the interstice of Artifacts and Diffusion focus on stereotypes as vehicles that produce and reproduce the objectification of women and their victimization.

3.1.4.3 Diffusion

Diffusion publications look at gender stereotypes transmitted by the marketing, packaging, and promotional materials and video game press. The video game market has a peculiarity that its major diffusers like Nintendo, Microsoft and Sony also produce and commission games, create an online market place for buyers via their game consoles and act as gate-keepers that authorize releases for their video game consoles. Game hardware companies are not only distributors, but sometimes producers, marketers and vendors as well. This concentration of power in the hands of just a few actors — and its repercussions on women in game production or female gamers —has been the subject of surprisingly little scientific research. Criticism of sexist attitudes on the part of game companies occurs primarily in professional publications and blogs, i.e., grey press, often in reaction to sexist comments by game designers and directors that produce hyper-sexualized, gratuitously naked female characters. Cortana (Fig. 3.7) is a good example as the character uses nudity as, according to Frank O'Connor, *Halo's* franchise director (by

Microsoft-subsidiary Bungie), a tactical advantage by putting her audience "on their guard."[178]

Criticism of their potential as a nexus of sexism — through their homogenous in-house and subsidiary development teams, corporate culture and choice of game development partners and subsidiaries; their commissioning of safe, formulaic game genres and established franchises; their gate-keeping role, conscious of protecting their brands' hardcore male audience at the expense of others — is a ripe subject for serious investigation.

3.1.4.4 Diffusion & Reception

Publications on the interstice of Diffusion and Reception focus on video games' impact on gamers through the gender stereotypes and violence portrayed in the game and its marketing and packaging. Analysis of the highly misogynistic #Gamergate movement that coalesced around ethical conspiracy theories between (male) game critics and (female) game developers fall into this interstice as well.

3.1.4.5 Reception

Reception (user) research looks at the effects of technology, computers and video games on female gamers: anxiety in public settings, gendered performance, appropriation of the geek and gamer identity, gendered access to technology, and gendered preferences in game genres. Often looking for sex differences, the female

[178]https://www.videogamer.com/news/halos_cortana_appears_nude_to_give_her_the_upper_hand_says_franchise_director

gamer experience is usually explored as a gender transgression, therefore the strategies used by girls and women to negotiate the demands of contemporary femininity are a popular research subject: male family members as gaming initiators and co-players; choices of game genres; differences in domestic policy, technological access and desire; appropriation of the "geek girl" identity; and performing gender while playing video games.

Research on children in after-school video game programs have some precedents, notably Catherine Beavis (2005), Diane Carr (2005), Valerie Walkerdine (2007), Taylor & Al. (2007), Yasmin Kafai (2008), and Jennifer Jenson and Suzanne de Castell (2010b & 2011). Their Anglophone research context differs from mine in that they studied children in the US, U.K., Australia and Canada, sometime with slightly older middle-school children. Amongst the most pertinent findings, Carr (2005) found that gaming tastes are alterable and site specific, and that accumulated gaming experience changes these preferences. Jenson and de Castell (2011) found that behavior associated with anxious feminine performance in video gameplay is actually the behavior of *inexperienced* players. By virtue of their lack of access, and therefore of limited experience, we associate the behavior of timid, awkward, unaccomplished players with female performance when it is simply beginner performance regardless of sex.

3.1.4.6 Reception & Production

Research in the interstice of Reception and Production focus on negative gender stereotypes regarding science: gamer, hacker, geek and scientist and stereotype threat related to out-group membership for women and Hispanic and African–

American minorities. Research that looks at the inspiration of high school girls for choosing a technical or scientific college major generally points to a faculty or parental/family mentorship rather than the development of technological passion through media consumption. In my email discussions with women in game development about family contexts and mentorship (that will be explored in the BSRI research in Chapter 5), most respondents came from highly supportive families who saw their daughter's gender-transgressive university and career choices as providing greater opportunities and financial stability. However, a surprising number of women came from unsupportive, conservative families who thought their daughters should choose traditionally feminine careers or become home-makers. These rebellious women chose to go into game development and programming as a backlash against such hostile, traditionalist views.

3.1.4.7 Production

Research in the production environment looks at the leaky digital pipeline that turn adolescent girls from math and science in middle and high school, keeps competent women from choosing computer science majors at university, keeps university and professional women isolated by lack of mentorship or hostile corporate culture, and forces female computer scientists out of the labor ICT labor force to meet the increasing time demands when starting a family.

Strategy to combat the decreasing number of women in ICT and software development tends to focus of different moments in the leaky pipeline. In the last years of middle and high school, high school girls are not taking advanced placement

tests in science and math in the same numbers as boys. In university, they drop out of their program even when their grades are superior to those of the male students.

Turkle and Papert (1991)[179] present a theory that women prefer to adopt a different thinking style or scientific approaches towards computer programming – the bottom–up, *bricolage* style rather than the top-down, planner style, stating that "epistemological pluralism is a necessary condition for a more inclusive computer culture." (Turkle & Papert 1991, p 185). The planner style is a "hard" abstract, canonical method of axiom > theorem > corollary used to define logical thinking and favored by academia and industry. *Bricolage* is a collaborative construction of theories through mastery of association and interaction with tools; it is a form of playful tinkering where errors are used for corrections midcourse. Although their assertion that one sex prefers one style over the other is provided through anecdotal evidence, some very successful male programmers in my entourage prefer a bricolage style to coding without feeling insecure in their approach. When I inquired about how they got through their university program with this approach, they stated that as long as their code worked professors rarely got into their code enough to discern a difference in their approach. This has not hampered their professional careers either.

[179] Turkle, S. and Papert S. (1991). Epistemological Pluralism and the Revaluation of the Concrete. In I. Harel and S. Papert (eds.). *Constructionism*. Ablex Publishing Corporation, 1991. (Reprinted in Journal of Mathematical Behavior, 11, 1, March 1992.)

3.1.4.8 Production to Artifact

Research in this interstice looks at the sexist tropes that are created due to lack of diversity in production teams. Provenzo (1991) found pervasive sex bias and gender stereotyping in Nintendo games and considers that stereotyped portrayals reveal the prevailing attitudes towards women in game culture. Schott & Hortrell (2000) in their study of girl gamers and gamer culture found that: *"Male designers who have developed games have traditionally preserved male dominance within the gaming industry based on their own tastes and cultural assumptions... Although gender representation has altered during the last decade, game developers openly state that their rationale for the inclusion of female characters is based upon the premise that they appeal more to the average boy gamer than an equivalent male character."* (p 37)

In her 2016 PhD dissertation, Robin Potanin studied two teams making racing games and found that "*personality and gender diversity or heterogeneity in game development coincides with disruptive communication spurring greater productivity, expanded game content and innovative product appealing to a broad target audience. The homogeneous team favoured 'siloed' sub-groups that produced high-quality work, hostile unproductive communication, a substantial amount of discarded content and missed delivery deadlines to create a product with limited audience appeal*." (p 4-5) This finding is in line with the findings by Philips (2014).[180]

[180] Phillips, K. W. (2014). How diversity works. *Scientific American*, 311(4), 42-47.

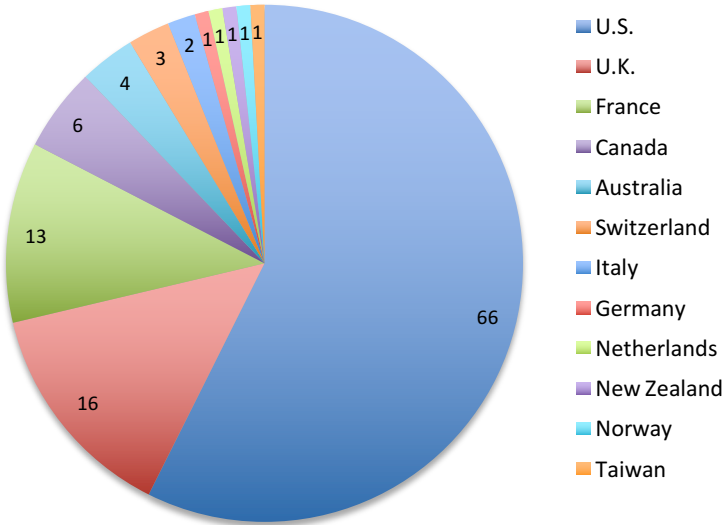
While tech companies talk of pipeline problems and encouraging more gender diversity, Wachter-Boettcher (2017) concludes that the industry encourages monocultures to decrease dissention and scrutiny of its ethical practices because it prefers maintaining its lack of regulatory oversight to diversifying their production team and making products and services responsive to a wider audience.[181]

3.1.4.9 My Research Domain: Production & Reception

My research straddles two domains, production and reception, identified by the red area of Figure 3.5. My first investigation is on gender stereotype resilience of the women working in video game production, see Chapters 4 and 5. My follow-up research is on 8-11 year old children playing gender-neutral video games at an after-school program in Paris, see Chapter 6.

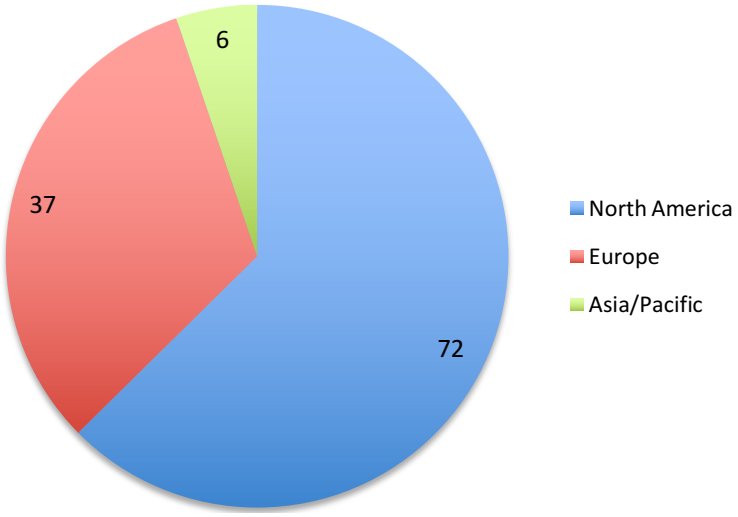
[181] Wachter-Boettcher, S. (2017). *Technically wrong: sexists apps, biased algorithms and other threats of toxic tech*. WW Norton. Kindle edition. See "9. Meritocracy Now, Meritocracy Forever."

3.1.5 Mapping Researchers and Networks



U.S.	66
U.K.	16
France	13
Canada	6
Australia	4
Switzerland	3
Italy	2
Germany	1
Netherlands	1
New Zealand	1
Norway	1
Taiwan	1
Total	115

Figure 3.8 Gender and technology researchers by country



North America	72
Europe	37
Asia/Pacific	6
Total	115

Figure 3.9 Gender and technology researchers by continent

If we look at primary researchers in gender and technology (see list in Fig. 3.10), we may be tempted to say that the topic is primarily an Anglo-Saxon concern, since the overwhelming majority of researchers are based in the U.S. (66 researchers out of 115), followed by U.K., Canada and Australia for a total of 92 Anglo-Saxon

researchers out of 115 (Fig. 3.8). U.S. researchers have overwhelmingly led the effort to explain the decreasing number of women in STEM ever since the peak of female computer science graduates in 1985 (35.8%), along with its subsequent decrease and stabilization in the 14-20% zone. (Krupa 2013, p 26) The U.S. leads in software production and understands that an industry struggling to recruit the best and brightest cannot limit itself to just half of the population.

Most feminist researchers in the US, adhering to the Individualist feminism discourse (see section 2.4.2 Feminism and its different epistemologies) that stresses individual agency along the lines of Sheryl Sandberg's *Lean In* (2013), are galvanized by women's missing financial and strategic opportunities to define and control ICT production and to create a more diverse culture that is welcoming to minorities. The *From Barbie To Mortal Combat: Gender and Computer Games* series of books and conferences (1998 and 2008) looked how gender and video games could become a vehicle for developing girl's interest in technology. Inherent in their goal is the belief that technological passion would bring women into the technological profession and provide concrete opportunities for the women themselves and other women - by creating products for wider audiences and by creating a diverse technical culture that is welcoming to the next generation. The path from passionate ICT consumer to passionate producer is much more difficult and complex, but belief that women's advancement achieved individually will bring broader social benefits remains constant in the researchers' objectives.

If we look at the European researchers (32%), we often find a more "socialist" feminist approach to technology along the lines of Talbot, Wajcman and Cockburn

that analyzes how technology is used to control women. Women's professional opportunities take a back seat to understanding the mechanisms of technological control in the service of the patriarchy. When feminist research becomes more specific to an industry or artifact, such as Collet's research on masculine technology stereotypes, its focus remains on the big picture, explaining broad interrelated concepts that affect the mindset of women choosing a gender-transgressive profession.

The two French language publications, *Girl Power Cahiers du Jeux Video #4* (2011) and *Genre et Jeux Video* (2015) may seem similar to the *From Barbie To Mortal Combat: Gender and Computer Games* series, but the objective of more women in STEM remains subservient to understanding gender representation and gender roles in video games. These publications finally establish gender and video games as a research problem in French discourse twenty years after their American counterparts because this was not a recognized problem beforehand.

3.1.5.1 Gender and Technology Researchers

Figure 3.10 is an edited, compiled list of over 115 researchers active in the study of gender and its implications in video games and STEM gender diversity. The goal was to keep track of researchers closest to my subject matter, their networks, evolving academic careers and research subjects, keywords, publications, websites, and contact information. Only basic information is included for the sake of conciseness, such as the last known educational institution. Researchers are organized by:

- Country,
- City,
- University (only 6 work in private organizations or industry), and
- Last name.

While the Anglo-Saxon researchers are heavily represented in my research, primary networks align themselves by language rather than geographic locations or research institutions. There is strong international networking with researchers joining organizations like the *From Barbie To Mortal Combat: Gender and Computer Games* book and symposium series, Women in Games International, The *International Journal of Gender, Science and Technology*, DiGRA, IGDA's Women in Game Development special interest group, Feminists in Games, and others.

Francophone research on gender and video games unite around the GenERe Lab at the University of Lyon, University of Paris and the University of Geneva in Switzerland.

Articles are often coauthored with colleagues from different labs or different countries, and most academic careers evolve by gaining experience in different institutions until tenure is achieved, especially in the United States.

Last Name	First Name	City	Country	Organization
Teage	Joy	Geelong	Australia	Deakin University
Fine	Cordelia	Melbourne	Australia	University of Melbourne
Beavis	Catherine	Sydney	Australia	Griffith University
Driscoll	Catherine	Sydney	Australia	University of Sydney
Consalvo	Mia	Montreal	Canada	Concordia University
Perron	Bernard	Montreal	Canada	University of Montreal
De Castell	Suzanne	Toronto	Canada	University of Ontario
Fisher	Stephanie	Toronto	Canada	York University
Jenson	Jennifer	Toronto	Canada	York University
Inkpen	Kori	Vancouver	Canada	University of British Columbia
Terlon	Claire	Paris	Farnce	Université de Paris 2
Spies	Virginie	Avignon	France	Université d'Avignon
Triclot	Mathieu	Belfort	France	Université de Technologie de Belfort
Morley	Chantal	Evry	France	Institut Télécom & Management Sud Paris
Zerbib	Olivier	Grenoble	France	IAE Grenoble
Mozziconacci	Vanina	Lyon	France	ENS Lyon
Lignon	Fanny	Lyon	France	Université de Lyon 1
Vachey	France	Paris	France	Paris 8
Zegai	Mona	Paris	France	Paris 8
Bonnot	Virginie	Paris	France	Paris Descartes
Letourneux	Matthieu	Paris	France	Paris Ouest
Buscatto	Marie	Paris	France	Université de Paris 1
Coville	Marion	Paris	France	Université de Paris 1
Blanchet	Alexis	Paris	France	Université de Paris 3
Breuer	Johannes	Cologne	Germany	University of Cologne
Tabet	Paola	Calabria	Italy	University of Calabria
Mosca	Ivan	Torino	Italy	University of Torino
Jansz	Jeroen	Rotterdam	Netherlands	Erasmus University Rotterdam
Schott	Gareth R	Waikato	New Zealand	Waikato University
Rasmussen	Bente	Trondheim	Norway	Norwegian University of Science and Technology
Collet	Isabelle	Geneva	Switzerland	University of Geneva
Gardey	Delphine	Geneva	Switzerland	University of Geneva
Bavelier	Daphne	Geneva	Switzerland	University of Geneva, University of Rochester
Lin	Hollin	Taiwan	Taiwan	National Taiwan University
Prescott	Julie	Bolton	U.K.	University of Bolton
Hines	Melissa	Cambridge	U.K.	Cambridge University
Walkerdine	Valerie	Cardiff	U.K.	Cardiff University
Rutter	Jason	Edinburgh	U.K.	University of Edinburgh
Tierney	Margaret	Edinburgh	U.K.	University of Edinburgh
Bryce	Jo	Lancashire	U.K.	University of Central Lancashire
Thornham	Helen	Leeds	U.K.	University of Leeds
Harvey	Alison	Leicester	U.K.	University of Leicester
Bogg	Jann	Liverpool	U.K.	University of Liverpool
Cockburn	Cynthia	London	U.K.	City University London
Wajcman	Judy	London	U.K.	London School of Economics
Hoyles	Celia	London	U.K.	University College London
Pelletier	Caroline	London	U.K.	University College London
Carr	Diane	London	U.K.	University of London
Herman	Clem	Milton Keynes	U.K.	The Open University
Littleton	Karen	Milton Keynes	U.K.	The Open University
Bix	Amy Sue	Ames, IW	U.S.	Iowa State University

Graner Ray	Sheri	Austin, TX	U.S.	Schell Games
Thorne	Barrie	Berkeley, CA	U.S.	UC Berkeley
Ivory	James D.	Blacksburg, VA	U.S.	Virginia Polytechnic Institute, VT G.A.M.E.R. Lab
Herring	Susan	Bloomington, IN	U.S.	Indiana University
Martins	Nicole	Bloomington, IN	U.S.	Indiana University
Taylor	TL	Boston, MA	U.S.	MIT
Pearce	Celia	Boston, MA	U.S.	Northeastern University
Brunner	Cornelia	Cambridge, MA	U.S.	Harvard EDC Center for Children and Technology
Caplan	Paula	Cambridge, MA	U.S.	Harvard University
Klawe	Maria	Claremont, CA	U.S.	Harvey Mudd College
Heeter	Carrie	East Lansing, MI	U.S.	Michigan State University
Sherry	John	East Lansing, MI	U.S.	Michigan State University
Winn	Brian	East Lansing, MI	U.S.	Michigan State University
Basow	Susan A	Easton, PA	U.S.	Lafayette College
Eagly	Alice	Evanston, IL	U.S.	Nortwestern University
Flanagan	Mary	Hanover, NH	U.S.	Dartmouth College
Dill-Shackleford	Karen	Hickory, NC	U.S.	Fielding Graduate University
Eccles	Jacquelynne Sue	Irvine, CA	U.S.	UC Irvine
Beasley	Berrin	Jacksonville, FL	U.S.	University of North Florida
Royse	Pam	Kutztown, NY	U.S.	Kutztown University
Subrahmanyam	Kaveri	Los Angeles	U.S.	Cal State
Sun	Jennifer Y.	Los Angeles	U.S.	Numedeon
Greenfield	Patricia	Los Angeles	U.S.	UCLA
Margolis	Jane	Los Angeles	U.S.	UCLA
Ito	Mizuko	Los Angeles	U.S.	University of California, Irvine
Bradshaw	Lara	Los Angeles	U.S.	University of Southern California
Fullerton	Tracy	Los Angeles	U.S.	University of Southern California
Williams	Dmitri	Los Angeles	U.S.	University of Southern California
Jenkins	Henry	Los Angeles	U.S.	University of Southern California
Lucas	Kristen	Louisville	U.S.	University of Louisville
Hyde	Janet Shipley	Madison, WI	U.S.	University of Wisconsin
Dickey	Michele	Miami, FL	U.S.	Miami University
Unger	Rhoda	Montclair, NJ	U.S.	Brandeis University
Phan	Mikki H.	Mountain View, CA	U.S.	Wichita State University, Google Inc.
Reuben	Ernesto	New York, NY	U.S.	Columbia University
Deaux	Kay	New York, NY	U.S.	CUNY Graduate Center
Honey	Margaret	New York, NY	U.S.	NYSCI
Nissenbaun	Helen	New York, NY	U.S.	NYU
Caplan	Scott	Newark, DE	U.S.	University of Delaware
Tracy	Dyanne M.	Oakland, CA	U.S.	Oakland University
Cherney	Isabelle D.	Omaha, NE	U.S.	Creighton University
Agosto	Denise	Philadelphia	U.S.	Drexel University
Newcombe	Nora	Philadelphia	U.S.	Temple University
Shaw	Adrienne	Philadelphia	U.S.	Temple University
Kafai	Yasmin	Philadelphia	U.S.	University of Pennsylvania Graduate School of Education
Cassell	Justine	Pittsburgh, PA	U.S.	Carnegie Mellon University
Hughes	Kristin	Pittsburgh, PA	U.S.	Carnegie Mellon University
Cooper	Joel	Princeton, NJ	U.S.	Princeton University
Terlecki	Melissa	Radnor, PA	U.S.	Cabrini University
Taylor	Nicholas	Raleigh, NC	U.S.	NC State University
Miller	Monica K.	Reno, NV	U.S.	University of Nevada
Burrill	Derek	Riverside CA	U.S.	UC Riverside
Koenig	Anne M.	San Diego, CA	U.S.	University of San Diego

Rosser	Sue V	San Francisco	U.S.	San Francisco State University | SFSU
Schiebinger	Londa	San francisco	U.S.	Stanford
Yee	Nick	San Francisco	U.S.	Stanford
Hoeft	Fumiko	San Francisco	U.S.	UC San Francisco
Lazzaro	Nicole	San Francisco	U.S.	XEO Design
Sweet	Elizabeth	San José, CA	U.S.	San Jose State University
Denner	Jill	Santa Cruz	U.S.	UC, Santa Cruz and ETR
Laurel	Brenda	Santa Cruz	U.S.	UC, Santa Cruz
Campe	Shannon	Scotts Valley, CA	U.S.	ETR (Education, Training, Research)
Cheryan	Sapna	Seattle	U.S.	University of Washington
Kelleher	Caitlin	St. Louis, MI	U.S.	Washington University
Crawford	Mary	Stors, CT	U.S.	University of Connecticut
Gee (Hayes)	Elisabeth	Tempe, AZ	U.S.	Arizona State
Burgess	MCR	Weatherford, OK	U.S.	Southwestern Oklahoma State University

Figure 3.10 List of A-publication researchers organized by country and institution

4. Study 1: Personality Types of Women in Game Development

4.1 Production: Research Program

4.1.1 Social Factors, Psychological Resilience and Personality Types

In exploring the potential causes for women's relative disinterest in ICT careers I've taken into account research from physiology, neurobiology, cognition, psychology, sociology, gender identity construction, mathematical ability, gender-based play and design preferences, programming styles, stereotype and stereotype threat, and self-esteem issues. (Krupa 2013) ICT (Information and Communication Technology) encompasses the diversity of professions that comprise the world of computer science: development of hardware, software, and networks. Video game development on any platform falls within the domain of ICT that is a subset of STEM's Technology and Engineering sectors.

There is little evidence of biological issues that would explain the gender imbalance in ICT. My hypothesis is that the gender imbalance found in ICT is mostly affected by a combination of social rather than physiological factors.

- Negative (often false or reductive) stereotypes against:
    - Women and math,
    - Women and technology (Cooper& Weaver 2003)[182], and
    - Computer (nerd/hacker) culture. (Breton, 1990)[183]
- Low self-esteem issues

[182] See Cooper & Weaver, *Gender and Computers*, 2003 for a thorough overview of research on negative effects of gender stereotypes and self-esteem issues regarding women and computers.

[183] Breton, La Tribu Informatique, 1990.

If these combined factors are so nefarious, how do the women currently working in ICT or other male dominated professions overcome or deal with them? What makes these women psychologically resilient? Is there a difference in the primary personality types of men and women working in ICT?

My hypothesis was that women working in ICT would most likely come from the "Rational" NT types (logical abstract iNtuitive Thinking types), be introverted and be representative of types that are underrepresented in the general female population.

4.1.2 MBTI: Why use the Myers Briggs Type Indicator

The Myers-Briggs Type Indicator (MBTI) is a psychometric self-reporting questionnaire designed to measure psychological preferences in how people perceive the world and make decisions. The MBTI is administered over 2 million times annually for education and human resource purposes to help individuals chose an educational or career orientation; therefore, the test remains particularly well-suited to our purpose even with significant criticism of its foundational theories and reliability[184]. The MBTI is based on Carl Jung's 1921 theories of psychological types and grew out of the questionnaire developed by Katharine Cook Briggs and Isabel Briggs Myers to help women entering the World War II industrial workforce identify jobs where they would be most effective.

[184] Numerous MBTI critics say the test is based on poor science because of Carl Jung's qualitative methodology and of the possibility of different outcomes in relatively short periods of time by the same test subject. If we assume that personality preferences may not be completely stable and accept that caveat, the MBTI's typology remains useful for its ubiquitous career and educational orientation purposes nonetheless. I limit my interpretations exclusively to its influence in perception and judgment.

The aim of the MBTI is to analyze what appears to be random behavior that Briggs and Meyers believe is actually orderly and consistent when based on how people prefer to use their perception and judgment.

- Perception: how we learn or become aware of things
- Judgment: how we reach conclusions

These can affect reactions, interests, motivations, skills and values.

4.1.3 The 16 Personality Types

Preferences are expressed on four dichotomies: Extravert/Introvert (E/I), Sensing/iNtuition (S/N), Thinking/Feeling (T/F) and Judging/Perceiving (J/P). These combinations create 16 personality types.

While we all exercise both modes of a single dichotomy, we usually have a preference for one value over another. If we consider a normal population distribution, this means that the majority of the population would have slight preferences rather than strong ones; these preferences can change with time, especially if they are slight.

4.1.3.1 MBTI Preference Values:

Extraversion/Introversion – What we prefer to focus on

- E: Focus on the outer world
- I: Focus on ideas

Sensing/iNtuition – Ways we perceive

- S: Through our five senses

- N: Through intuition, with relationships established beyond the conscious mind.

Thinking/Feeling – Ways we make judgments

- T: based on logical consequences
- F: based on personal or social values

Judging/Perceiving – How we deal with the outer world

- J: prefers using TF (making judgments)
- P: prefer using SN (making observations)

Each preference is expressed on a scale of 100. For our purposes, the predominant value is positive and its dichotomy is negative. (e.g. since iNtuition is the predominant preference for women in game development, Sensing would be counted on the negative scale.)

4.1.4 MBTI Gendered and Cultural Preferences

MBTI Types are not evenly distributed into the 16 groups; certain combinations are also less present in male and female populations. Every culture has a gendered preference that it supports, and this is often the most prevalent type for a particular gender. The highest representation for women is ESFJ category according to MBTI Manual stats[185], and this is believed to be the preferred type in North American culture for women. This type is the most closely aligned with the stereotypical expectations of

[185] Myers & McCaulley, *MBTI Manual,* 1985, pg 36-48.

how women should behave: extraverted, emotional, attuned to others, matter of fact, judging…

Types that deviate significantly from this cultural preference may have trouble expressing their differences and preferences. Women with non-supported types may find it hard to use their talents, disguise their nature, and be less effective because of wasted energy. Most importantly, self-esteem is positively affected for preferred types like ESFJ and negatively affected for non-preferred types like INTP.

4.1.5 MBTI Research Methodology

My original hypothesis was that women working in ICT would most likely come from the "Rational" NT types (Logical Ingenious types), be introverted and be representative of types that are underrepresented in the general female population.

I recruited self-declared women who work in game/software development companies through my personal networks and through various international mailing lists/blogs such as Women in Game Development (part of the IGDA), Girl Geek and Women in Game Jobs. My research subjects are internationally based, with a large representation from the US, UK and France due to the Anglophone and Francophone networks that these women join. (Raw MBTI data for these women is presented in the appendix 7.2.)

94 self-declared women (including a trans-woman) took the 72-question MBTI online and emailed me their scores along with a description of their professional history, age and country of birth/country of residence. I classified the self-defined titles into four disciplines: programming, art/animation, design/writing, or business/management. Many women in the sample described long careers and had held multiple types of

positions; however, they were assigned to one category depending on their most technical level. A trend was identified whereby senior “technical” women often moved into management positions as their careers evolved rather than advancing into technical specializations.

Their MBTI figures were first averaged as individual MBTI preferences and again as dichotomies for all women of the sample and within their self-defined professional activity: Programming, Art/Sound, Design/Writing or Management.

I then compared these results to four other appropriate MBTI databases :

- **IGAD –** International Game Architecture Design (Potanyn & Davies 2011)
- **BSM Consulting -** (2010) General population
- **High School Females** (MBTI Manual 1985)
- **Female College Graduates** (MBTI Manual 1985)

The database comparison uses percentages of a defined population distributed over the 16 MBTI types.

4.2 Production: Research Findings

	94 women	Introvert	Extrovert	Sensing	iNtuition	Feeling	Thinking	Judging	Perceiving
	count	*94*			*94*	*94*		*94*	
	Average	**16.00**			**41.94**	**11.66**		**21.20**	
		Introvert	Extrovert	Sensing	iNtuition	Feeling	Thinking	Judging	Perceiving
Programming	*count*	*25.0*			*25.0*	*25.0*		*25.0*	
25 women	**Average**	**31.0**			**44.7**	-5.4	**5.4**	**11.5**	
Art	*count*	*17.0*			*17.0*	*17.0*		*17.0*	
17 women	**Average**	**30.0**			**49.6**	**13.9**		**35.0**	
Design/writing	*count*	*21.0*			*21.0*	*21.0*		*21.0*	
21 women	**Average**	**6.6**			**41.4**	**26.7**		**6.6**	
Management	*count*	*31.0*			*31.0*	*31.0*		*31.0*	
31 women	**Average**	**2.6**			**35.8**	**14.0**		**31.3**	

Figure 4.1. Personality preferences of women in games as a dichotomy.

In Figure 4.1, each preference is expressed on a scale of 1(min)-100 (max). The minority preferences values (Extroversion, Sensing, Thinking, Perceiving) are subtracted from majority preferences values (Introvert, INtuition, Feeling, Judging), then averaged.

		Introvert	**Extrovert**	**Sensing**	**iNtuition**	**Feeling**	**Thinking**	**Judging**	**Perceiving**
	Average	**44.3**	36.4	14.4	**50.2**	**40.9**	29.6	**35.4**	25.3
	Count 94	*61*	*33*	*12*	*82*	*55*	*39*	*72*	*22*
		Introvert	**Extrovert**	**Sensing**	**iNtuition**	**Feeling**	**Thinking**	**Judging**	**Perceiving**
Programming	*count*	*18.0*	*7.0*	*4.0*	*21.0*	*10.0*	*15.0*	*16.0*	*9.0*
25 women	**Average**	**51.2**	**21.0**	**5.0**	**54.2**	**44.0**	**38.4**	**37.7**	**35.0**
Art	*count*	*14.0*	*3.0*	*2.0*	*15.0*	*10.0*	*7.0*	*15.0*	*2.0*
17 women	**Average**	**46.9**	**48.7**	**13.0**	**58.0**	**40.0**	**23.4**	**41.1**	**11.0**
Design/Writing	*count*	*12.0*	*9.0*	*2.0*	*19.0*	*15.0*	*6.0*	*13.0*	*8.0*
21 women	**Average**	**38.8**	**36.3**	**1.0**	**45.9**	**44.1**	**16.8**	**24.1**	**21.8**
Management	*count*	*17.0*	*14.0*	*4.0*	*27.0*	*20.0*	*11.0*	*28.0*	*3.0*
31 women	**Average**	**38.9**	**41.4**	**31.3**	**45.7**	**37.4**	**28.5**	**36.3**	**15.0**

Figure 4.2a Strength of each personality preferences of women in games averaged separately.

In Figure 4.2a, each preference is expressed on a scale of 1(min)-100 (max) and averaged separately. *Count* indicates the number of women participants in the sample,

e.g., of 25 programmers counted, 18 were counted as introverted and 7 were counted as extroverted. The very strong Intuition preferences and weak Sensing preferences for all professional groups becomes even more apparent when looked at this way.

Figure 4.1 identifies the average woman with a games profile to be INFJ: Introversion, iNtuition, Feeling, Judging. Figure 4.2a&b provides finer grain details to show that the greatest discrepancy is between Sensing and iNtuition preferences in all categories except Management.

Strength of Personality Preferences -
Each preference is averaged separately

	All	Program	Art	Design	Mngmt
Introvert	44.3	51.2	46.9	38.8	38.9
=	61	18	14	12	17
Extrovert	36.4	21.0	48.7	36.3	41.4
=	33	7	3	9	14
Sensing	14.4	5.0	13.0	1.0	31.3
=	12	4	2	2	4
Intuition	50.2	54.2	58.0	45.9	45.7
=	82	21	15	19	27
Feeling	40.9	44.0	40.0	44.1	37.4
=	55	10	10	15	20
Thinking	29.6	38.4	23.4	16.8	28.5
=	39	15	7	6	11
Judging	35.4	37.7	41.1	24.1	36.3
=	72	16	15	13	28
Perceiving	25.3	35.0	11.0	21.8	15.0
=	22	9	2	8	3

Figure 4.2b Individual MBTI preferences from Figure 4.2a, (Data visualization by Deborah Wickham)

While a strong Introversion and iNtuition preference amongst all categories was expected, only female programmers had a very slight preference for Thinking over Feeling. There is a clear Judging preference over Perceiving, but this is also the case in the general population. So the predominant MBTI types for women in games are not

NT but NJ (Visionary Decision–Makers according to Myers & Mcaulley 1985), making up 68.1 % of my subjects.[186]

What we can surmise about this group of women working in ICT is that they have:

- Very clear preferences for using iNtuition for perception,
- Slight preference for Introversion (with art and management having a very slight Extraversion preference),
- Unexpected slight preference for Feeling judgments (with programmers having a very slight Thinking preference), and
- Clear preference for Judging (with programmers and designers having the slightest preference).

These preferences are in line with the intellectual aspects of the profession that requires logic, decision-making and creativity.

What is interesting is the commonality of the women's preferences regardless of the type of work that they actually do. INFJ and INTJ subjects come from all four professional categories: programming, art, design and business.

Finally, how does this compare to other populations such as women in high school and university , the general population and men in game development?

4.2.1 MBTI of Women in Games Compared to Other Databases

Following is a table comparing percentages of MBTI types in different population types (Fig. 4.3). Women in Games (WIG) are my results. The second set of data is from the International Game Architecture Design (IGAD) students from NHTV University of

[186] See Figures 4.3 and 4.4 for details.

Applied Sciences, Breda, Netherlands compiled by Potanyn & Davies (2011).[187] BSM Consulting (2010) tested over 6000 online participants and serves as a contemporary random-population sample data.[188] The female high school and college graduate percentages come from the official MBTI Manual (1985).[189]

While it would have been ideal to replicate the test with male professional game developers (since language, age and professional experience[190] could affect the MBTI results), time constraints obliged me to compare the WIG and IGAD distributions since these databases correlated reasonably well.

Potanyn & Davies (2011) compiled the MBTI results of 135 IGAD game art/design/development students using the same online MBTI test as my participants.[191] 13 of those students were women, which correlates to the industry average of 10% women. Strength of preference was not tracked, nor can the 13 female participants be isolated from the results. There is also a larger percentage of art students, much fewer design and production/management.

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[187] Potanin R., & Davies O. (2011). Designing the Designer. Proceedings from Digital Research Association 5th International Conference - Think, Design, Play. September 2011. http://www.digra.org/dl/db/11313.33017.pdf

[188] BSM Consulting, based on over 6000 participants who took the online MBTI http://www.personalitypage.com/html/demographics.html,.

[189] Myers & McCaulley, Manual, pg 48. Based on 20,006 females.

[190] Already a competitive domain, the game industry is notorious for "burning out" game developers within two to three years in the industry. Long hours have been pinpointed as a cause for women leaving the industry, especially after the birth of the first child. While my data focused on women with 3-30 years of professional experience, we cannot predict how many of these game students will really work in the profession.

[191] Online MBTI test: tables

Even with these constraints, the distribution of the mostly male students varies significantly from the women in game as shown in the next few tables. (Fig. 4.3 a&b and Fig. 4.4)

MBTI	WIG Percentage	IGAD Percentage*	BSM Online Percentage*	**Female HS Students	**Female Univ. Grads
ENFJ	11.7	12.6	4.3	4.7	7.9
ENFP	8.5	5.9	11.4	13.0	9.6
ENTJ	8.5	12.6	2.3	4.7	6.8
ENTP	2.1	3.7	3.6	4.7	4.1
ESFJ	2.1	6.7	8.6	14.5	8.9
ESFP	1.1	4.4	5.4	14.0	3.0
ESTJ	1.1	5.9	7.2	4.7	8.5
ESTP	0.0	1.5	2.8	6.2	0.8
INFJ	26.6	5.9	5.9	2.1	6.9
INFP	4.3	0.7	11.5	7.8	7.4
INTJ	21.3	16.3	3.0	1.6	5.8
INTP	5.3	4.4	4.0	3.1	3.6
ISFJ	2.1	5.9	12.0	6.2	12.1
ISFP	1.1	0.7	6.0	6.7	3.0
ISTJ	3.2	8.1	8.8	3.1	10.2
ISTP	1.1	4.4	3.2	3.1	1.4
Total	100.0	100.0	100.0	100.0	100.0

Figure 4.3a MBTI database comparison in percentages: WIG - Women in Games; IGAD - International Game Architecture Design (Potanin & Davis 2011); BSM Consulting - (2010) general population; High School Females (Myers & McCaulley 1985); Female College Graduates (Myers & McCaulley 1985).

%	WIG	IGAD	BSM	HS FEMALES	FEM COL GRADS
ENFJ	11.7	12.6	4.3	4.7	7.9
ENFP	8.5	5.9	11.4	13.0	9.6
ENTJ	8.5	12.6	2.3	4.7	6.8
ENTP	2.1	3.7	3.6	4.7	4.1
ESFJ	2.1	6.7	8.6	14.5	8.9
ESFP	1.1	4.4	5.4	14.0	3.0
ESTJ	1.1	5.9	7.2	4.7	8.5
ESTP	0.0	1.5	2.8	6.2	0.8
INFJ	26.6	5.9	5.9	2.1	6.9
INFP	4.3	0.7	11.5	7.8	7.4
INTJ	21.3	16.3	3.0	1.6	5.8
INTP	5.3	4.4	4.0	3.1	3.6
ISFJ	2.1	5.9	12.0	6.2	12.1
ISFP	1.1	0.7	6.0	6.7	3.0
ISTJ	3.2	8.1	8.8	3.1	10.2
ISTP	1.1	4.4	3.2	3.1	1.4

WIG - WOMEN IN GAMES
IGAD - INTERNATIONAL GAME ARCHITECTURE DESIGN
BSM CONSULTING (2010)
HIGH SCHOOL FEMALES
FEMALE COLLEGE GRADUATES

Extravert / Introvert - What we focus on
- E / Focus on the outer world
- I / Focus on ideas

Sensing / Intuition - Ways we perceive
- S / Through our sense
- N / Through intuition, with relationships established beyond the concious mind

Thinking / Feeling - Ways we make judgments
- T / based on logical consequences
- F / based on personal or social values

Judging / Perceiving - How we deal with the outer world
- J / prefers using TF (making judgments)
- P / prefer using SN (making observations)

Figure 4.3b Distribution in percentages of 5 MBTI databases. (Data visualization by Deborah Wickham.)

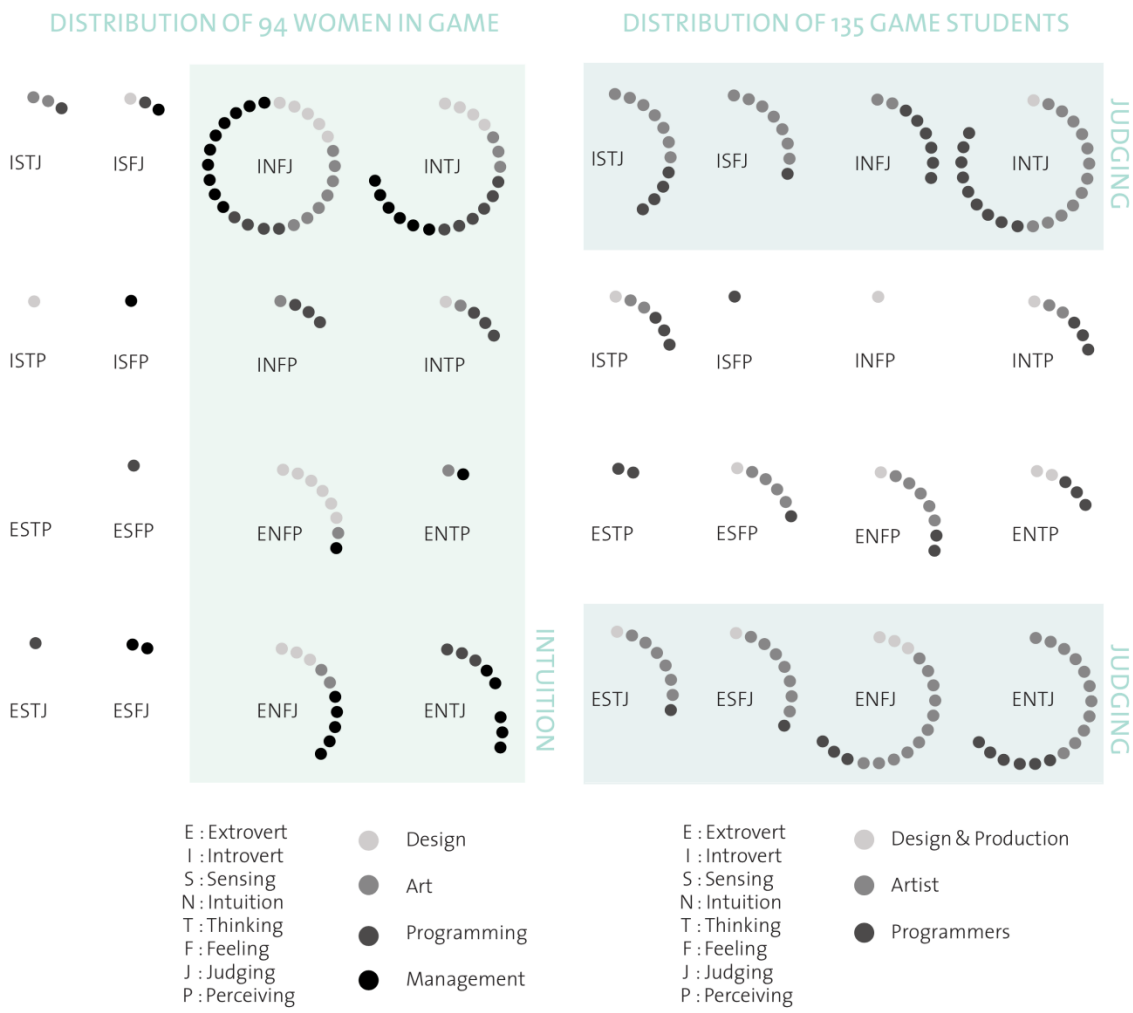

Figure 4.4 MBTI distribution of 94 women in games and 135 mostly male IGAD game students. Data visualization by Charlene Bach+

The results can be summed up this way: Women in technology, regardless of their actual profession, are primarily from personality types that are relatively rare in the general population: INFJ (26.3% of subjects) and INTJ (21.3% subjects). Almost half the test subjects were from two MBTI types that normally comprise just 3.7% of female high school students or 13% of female college graduates. (Myers & McCaulley 1985)[192]

[192] Myers & McCaulley, *Manual,* pg 36-48 and BSM Consulting http://www.personalitypage.com/html/demographics.html,

If we look at the first 2 WIG MBTI types in Figure 4.3 (INFJ 26.6% and INTJ 21.3%), they cover 47.9 % of my research subjects (45 of 94 women). As stated before, these types are among the least frequent personality types for every category of female MBTI test takers except amongst female college graduates. The concentration of 48% of the women into just two personality preferences (INFJ & INTJ), 68% of the women in the NJ quadrant, and 87% of the women in the iNtuition sector highlights the striking absence of Sensing women in game development.

IGAD's top MBTI type are INTJ (16.3%), ENTJ and ENFJ (12.6% each), and in 4th position is ISTJ at 8.1% for IGAD. If we look at the general IGAD distribution, those mostly male students are much more heterogeneously distributed than the women in games, with many more Sensing types.

Both men and women in game development seem to have a preference for NJ (iNtuitive Judging) combinations, but their overall distribution patterns are quite different. For women in games, iNtuition seems to be the leading personality component, while for men, Judging is the leading personality preference. Women are clearly clustered in the intuitive half of the matrix, with a noticeable absence of Sensing women, while the men are mostly clustered in the SJ and NJ sections but with a more heterogeneous distribution.

In summary:

- NJ: "Visionary decision-makers" – strive to accomplish goals of inner visions. It is the top combination for both WIG and IGAD
- SJ: "Realistic decision-makers" – seek order. Organized, dependable, conservative. It is the second most frequent for IGAD, but last for WIG.
- NP: "Adaptable innovators" – outer world focus on possibility, inner on judgment, seek new challenges, unconventional, independent and dislike

> constraints and commitments. It is the second combination for WIG third for IGAD.[193]

According to Myers & McCaulley (1985), iNtuitive types are inventive, abstract thinkers that process and retrieve information through patterns and impressions. They rely less on rules for storing, recalling and interpreting information, and feel that a blind devotion to rules or methods can impede optimization. This capacity for creative abstract thinking and pushing boundaries is a skill needed by scientists, artists and designers.

Sensing types process and retrieve information based on sensory perception and focus on facts. In order to optimize and make sense of these facts, rules are called to validate and structure their thinking. Rules, methods, norms, and conventions are very important to Sensing types. As a result, Sensing types are frequently considered more "conservative" than iNtuitives because they trust and apply rules, norm and conventions with less skepticism. Sensing types are less likely to question a rule's validity or recognize a stereotype or bias. Sensing types often find themselves in process-oriented jobs like law and order or accounting. Follow-through and methodology is a critical skill in game production as game projects often require huge development teams, big budgets, and iterative processes. Sensing types are needed in game production and management.

The absence of Sensing women in game development is not surprising since they would be more likely to have been swayed from STEM education/careers by negative gender stereotypes that they might mistaken for norms.

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[193] Myers & McCaulley, *Manual*; pg 36-7.

So why are there so many male Sensing types in a sample that is heavily represented by game artists? Positive masculine technology and video game stereotypes encourage male Sensing types who believe this a natural profession for them to pursue.

This dearth of female Sensing types effectively means that game development companies could have a wider pool of talented candidates were it not for those negative stereotypes.

4.3 Discussion: Women, Personality Profiles and Technology

This study is not a validation of the skills required to excel in game development. Instead, it is a snapshot of the female personality types that are most likely to overcome the sociological hurdles that keep many women from entering male dominated professions.

Combining these findings with the theory of MBTI cultural preferences, female personality types that choose to go into technology careers have personality preferences that deviate significantly from the cultural preference of the extraverted, sensing, feeling, judging female.

According to MBTI cultural preference theory, cultural pressures and expectations (from parents, siblings, teachers, peers…) to adapt to female stereotypes are often exercised on personality types that deviate from it; however, women with strong iNtuition preferences are more likely to disregard established rules or conventions and ignore negative gender stereotypes through individual agency. Therefore, iNtuitive women are less likely to adhere to or be influenced by gender stereotypes.

The psychological resilience of women in technology may be due to working in a field that uses their natural skills, interests and motivations. The profession suits their natural preferences for theoretical, abstract, creative work, so they work in optimal conditions for their preferences. They have probably had to confront cultural pressures of female stereotypes from a young age and have grown resilient to them. Lastly, self-esteem issues have been surmounted through talent, skill and hard work.

MBTI	Kiersey Description	Principal Design Skill/Motivation	Management Skill/Motivation	WIG	high school	univ. grads
INFJ	Counselor (Idealist)	Strong desire to contribute to the welfare of others	Cooperation	26.6	2.1	6.9
INTJ	Mastermind (Rational)	Contingency planning	Efficiency and pragmatism	21.3	1.6	5.8
			Total	**47.9**	**3.7**	**12.7**
ENFJ	Teacher (Idealist)	Pedagogy	Organization	11.7	4.7	7.9
ENFP	Champion (Idealist)	Storytelling	Motivational	8.5	13.0	9.6
ENTJ	Field Marshal (Rational)	Strategic and structural planning	Leadership, goal oriented	8.5	4.7	6.8
			Total	**76.6**	**26.1**	**37.0**
INTP	Architect (Rational)	System Design	Logic and pragmatism	5.3	3.1	3.6
INFP	Healer (Idealist)	Storytelling	Ethics	4.3	7.8	7.4
			Total	**86.2**	**37.0**	**48.0**

Figure 4.5 MBTI Categories for Women in Games, female high school students and female college graduates, their associated design and management skills and motivations, and percentages

In Figure 4.5, we see that the top seven WIG categories covering 86% of the participants come from the two principal categories: the Idealists (Abstract Cooperators) and the Rationals (Abstract Utilitarians).[194] While both groups prefer to focus on the internal, abstract world of ideas, they differ in their actions and motivations. Utilitarians prefer to focus on efficiency (what works) and perhaps worry about observing rules or protocols afterwards, while Cooperators try to do what's

[194] Kiersey, *Please Understand Me II*, 1998. See also www.keirsey.com, retrieved 28/5/2013

right, follow social rules, and later worry about the efficacy of their actions. While Rationals appreciate technology for technology's sake, the social impact of technology is of primary importance to Idealists.

In the mostly male IGAD population, a large representation of Guardians (Concrete Cooperators - who tend to focus on reality, duty and responsibilities) is noticeably absent of women in technology. This group tends to thrive at the production phase, but the adherence to social rules, norms and stereotypes effectively keep Guardian women out of SET careers.

4.3.1 Strategies for Getting More Women into Technology

Once again, this study does not seek to identify or validate an ideal type for thriving in ICT professions. If the male and female distributions were more closely aligned, we could perhaps infer that certain personality types were more "natural" for a career in ICT than others, but this is not the case. The ICT field needs diversified profiles and personalities, and the sociological barriers like negative stereotypes strongly discourage diversity of personality types in ICT female professionals by women who believe they may be naturally unsuited for working masculine professions.

The strong preference of Women in Games for iNtuition over Sensing is key, but Sensing men are not discouraged from entering the profession. Just as positive masculine technology stereotypes encourage Sensing men to pursue an ICT career, negative stereotypes of women and technology - reinforced since early childhood - discourage Sensing women.

Women who choose to go into technological professions are often inclined to focus on ideas (introverted), but more importantly, they trust intuition more than established rules, conventions, or stereotypes, allowing them to be resilient to the negative stereotypes.

Statistics show that iNtuition increases with age. Can resilience be an acquired skill? But instead of asking women to be resilient to sexist bias, perhaps we should be working towards the abolition of stereotypes that reinforce the idea that computers are the natural domain of boys and men.

How can we enlarge/adapt this profession to be more inclusive and/or attractive to other profiles, notably Sensing women, by purposefully addressing negative stereotypes? Culturally co-constructed stereotypes have an impressive stability that we will examine with the BSRI's retrograde gender-roles in the next chapter. Constant and considerable effort must be brought forth to question sexist technology stereotypes; this has been an ongoing concern in the Anglophone press for the past few years. Will this increased scrutiny and criticism achieve the neutralization of technology's masculine gender in the 21st Century?

In the meantime, one recommendation gathered from the principal motivations for the Idealist WIG MBTI categories in Figure 4.5, would be to stress the positive impact of technology on the wellbeing of others rather than focus on technology for technology's sake, a component which motivates Rational types. The pervasiveness of technology means that Rational women can more easily see the value of working in ICT, and their disregard for norms and conventions make them a natural group for entering male-dominated professions. However, to attract other profiles like the Guardians and

Artisans, significant effort will be needed to change public perception and its belief that technology is a naturally masculine occupation.

5. Study 2: Sex-role Orientation of Women in Game Development

5.1 Production: Research Program

If technical women's skepticism towards rules was key to their stereotype resilience, how did they manage their gender identities in a culture full of prescriptive and hostile gender norms? In Chapter 2 we discussed the conflict between masculine scientific and hacker stereotypes and feminine stereotypes (Collet 2005 & 2006), however, it is worthwhile exploring another negative stereotype that women in technology are confronted with, the androgynous geek girl. (Bury 2011)

Following Sandra Bem's theory (1974, 1981, 1983, 1993) that androgyny (high femininity and high masculinity) provides the most flexible behavioral options for individuals, undertaking the study I expected to find that women in game development have either cross-sex typed *masculine* orientation for female participants or androgynous gender role orientation as defined by the Bem Sex Role Inventory (BSRI, 1974). This may indicate another source of resilience to stereotype threat.

5.1.1 Bem Sex Role Inventory (BSRI)

Over the course of a year I sent questions to the IGDA special-interest-group women in game development mailing list about the role and profession of parents, sex role socialization by the family and childhood toy choices for these women who were veterans of the video game industry. The end of this chapter includes some of this

discussion. After the success of my MBTI study, the next step was to do a BSRI study with this group.

Stanford psychology professor Dr. Sandra Bem developed the BSRI from 1972-74 to measure psychological androgyny. (See section 2.3.2.2 on Bem's Gender Schema Theory) 200 Stanford University students characterized behaviors and attitudes as masculine, feminine, or neutral to establish the terms of the BSRI. Sixty items (20 masculine traits, 20 androgynous traits, and 20 feminine traits) are score on a Likert Scale (score of 1-7) according to one's orientation to those values. Items concerning leadership, decision making, risk taking, aggressiveness, and willingness to defend one's views were deemed "masculine", while compliance, listening, hesitation, and love of children were deemed "feminine." Indeed, I had strong reservations that the BSRI was an adequate measure of contemporary sex roles and attitudes.

First, I took the BSRI to measure myself. As a university chair and working for twenty years in masculine professions, my score of 82 masculine, 51 feminine and 53 androgynous points places me on the borderline between Cross Sex-Typed (using earlier criteria) and Androgynous (using contemporary criteria). I do not consider myself particularly masculine, nor do I consider leadership or strength of character to be masculine traits. Even though my initial reaction to my results according to the BSRI was that it did not fit my conception of masculine and feminine traits, it illustrates culturally defined gender stereotypes regardless of my disapproval of its values.

Stereotypes are very stable and require tremendous socio-cultural efforts to question and redefine them. Even then, negative stereotypes may remain as an

unconscious bias that can yield sexist, racist, ageist, classist, and/or homophobic repercussions. Seeing the responses of the women in the IGDA women_dev mailing list, those growing up in conservative, anti-feminist households were clearly still subjected to these stereotypes about feminine and masculine behavior. So, I proceeded with the BSRI study.

5.1.2 Methodology

Having succeeded in getting a good response level for my MBTI study, I contacted the women that participated in the initial MBTI study through the IGDA women_dev mailing list (women_dev@igda.org) and Women in Games groups, asking them to participate in the BSRI study. I provided them with a link to the test[195] and asked that they email me their results privately. I asked for the following information:

- Your feminine, masculine and androgynous BSRI scores:
- Your Sex:
- Your Age:
- Your Job Position(s):
- Years in the Industry:
- Country (birth/currently residing):
- On a scale of 1 (not important) to 10 (very important), how important was it that you engage in sex-appropriate activities for your parents when you were a child (< 12)? (feel free to share anecdotes)
- Your favorite toys/games (< 12)?

I expected some women would have the same initial negative reaction that I experienced with this test and that they might balk at sharing the results with me.

[195] http://garote.bdmonkeys.net/bsri.html (Link sent list members on Nov. 24, 2014)

Hoping to moderate the unease some respondents might have about their results, I explained that this was about measuring one's alignment with gender stereotypes as defined in 1970's.

5.1.3 Challenges and Problems

While I had no problem getting responses to the MBTI study in the first phase (94 volunteers in 3 weeks), I only received 14 responses to my BSRI study even after multiple requests. A dismal response rate. I believe more women took the test but were too unsettled or upset by their test results to send me their masculine, feminine and androgynous scores.

Being that the women solicited to participate in the study are not gender theory experts they may have had a hard time reconciling their self-image with the androgynous "geek girl" stereotype rampant in the profession. Those that received high masculine and low feminine scores may have they felt too insecure, fatigued or sensitive about their femininity to share their results with me.

Ethically speaking, upsetting my respondents with results that conflicted with their self-image was a major preoccupation of mine for this study. I fear this may have been the case. I myself had had an initial reaction that was quite hostile to the results, not because I was insecure with my gender identity, but because of the violence of hearing my sex-role orientation to be borderline cross-sex-typed masculine/androgynous. The unfairness of being judged by retrograde, sexist stereotypes to evaluate a person's sex-role orientation does not mitigate the fact

that we are constantly being judged by these male chauvinist, culturally co-constructed stereotypes, whether we like it or not.

With only 14 respondents, the study is statistically inconclusive.

5.2 Production: Research Findings

With such a limited sample of 14 self-reporting women, one hesitates to draw conclusions. But if we were to analyze patterns, even from this meagre sample, a trend is visible. Only two women had higher feminine score and below average masculine scores and were therefore "sex-typed feminine." Most interestingly, the highest feminine score was a trans-woman programmer; the other was a young software consultant. The cross-sex-typed masculine woman was a doctoral student. 11 out of the 14 women were considered Androgynous with higher masculine scores, above average feminine and above average androgyny scores. According to contemporary interpretations of the BSRI, feminine and masculine values over 50 indicate androgyny, but initially, feminine and masculine values needed to be close to rank as androgyny. Using contemporary BSRI scoring of 14 participants:

- 11 women were androgynous (7 of the 11 would have been previously classified as cross-sex typed masculine)
- One woman was cross-sex typed masculine, and
- Two women were sex-typed feminine.

Job Title	Masculine	Feminine	Androgyny	Age	Experience	Birthplace	Current Country	Parent Gender Socializ.
Senior Programmer	38	72	60	31	10	Canada	US	2
Software consultant	46	62	63	25	4	UK	UK	5
Producer	53	57	57	36	15	US	US	1
PhD Cand. Games & Digital Media	56	43	51	28	6	US	US	3
Assistant Professor, Game Design	62	74	53	50	25	US	US	2
Help Desk	63	57	60	22	3	US	US	1
Marketer, Graphic Designer, Advocate	71	53	54	32	6	US	US	3
Lead Writer	73	51	51	38	10	US	US	5
UX Designer	75	56	50	42	15	US	US	1
Game Translator	76	70	64	33	10	Spain	Spain	**5**
Project Closer	76	60	68	30	8	US	Canada	3
ICT Director	77	62	53	42	18	UK	UK	1
Senior Software Engineer	78	53	53	35	10	Italy	Sweden	2
Interaction UX	82	53	53	45	17	Belgium	France	1
	Masculine	Feminine	Androgynous	Age	Prof. Exp. in years			Sex Role Socializ.
Average	**66,143**	**58,786**	**56,429**	**34,929**	**11,214**			2,5
Count	14,000	14,000	14,000	14,000	14,000			14
St. Dev	**13,456**	**8,675**	**5,639**	**7,869**	**6,129**			1,557
Min	**38**	**43**	**50**	**22**	**3**			1
Max	**82**	**74**	**68**	**50**	**25**			5

7	Currently Androgynous but would previously have been considered Cross-sex Typed Masculine
4	Androgynous
2	Sex-typed feminine
1	Cross-Sex typed masculine

Figure 5.1 BSRI results from 14 women in game development.

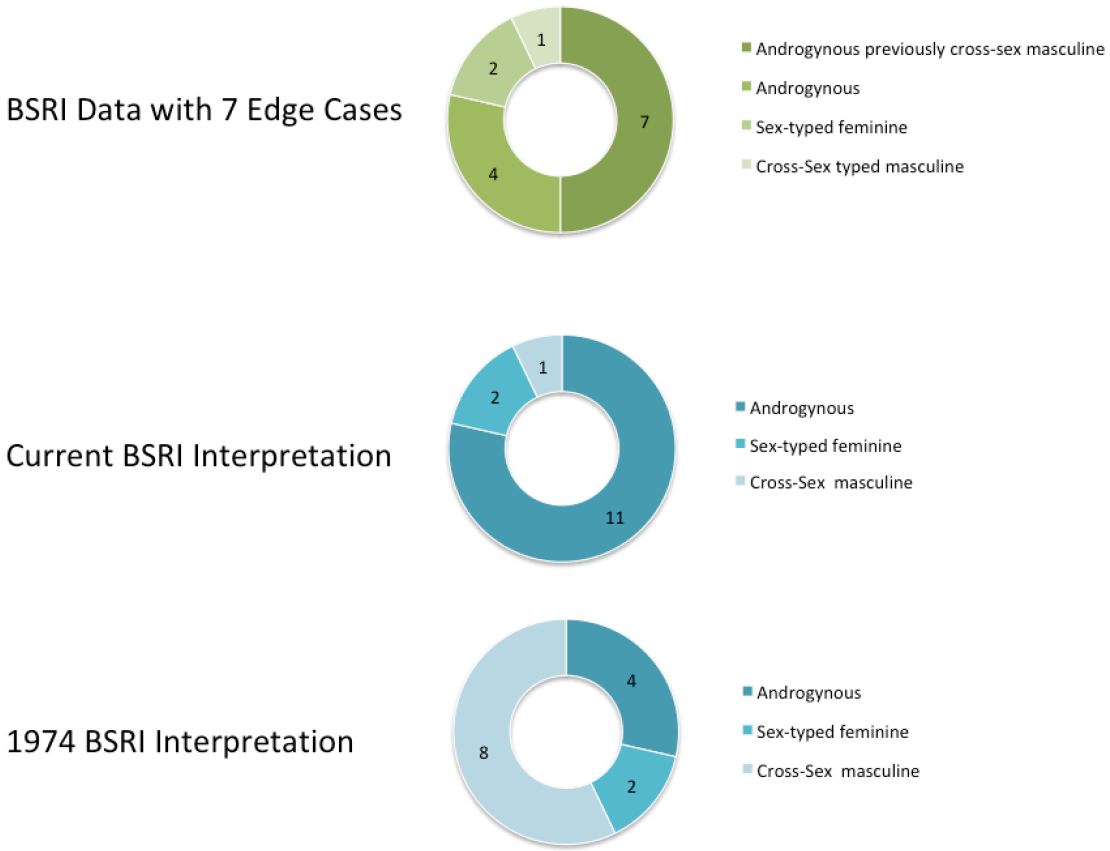


Figure 5.2 BSRI categories from 14 women in game development. 7 women would have been rated cross-sex-typed masculine using the initial BSRI 1974 scale (masculine and feminine scores needed to be close), but are now considered androgynous (masculine and feminine scores must be above 50).

One particularly important element concerning research methodology is that by redefining the BSRI scoring interpretations, we have quite different results as shown in Figure 5.2. In 1974, the majority of women would have been cross-sex-typed masculine (8 of 14), while they are now overwhelmingly androgynous (11 of 14).

5.3 Discussion: Women in Game Development's Domestic Sphere

Humbled by the weak responses to the BSRI questionnaire, I decided to stop the BSRI questionnaire research after 4 weeks. Interesting discussion points were brought forth when I asked about early domestic and parental socialization to the Women in Game Dev mailing list, so I continued this discussion with the IGDA women_dev group. I asked if their parents' professions, gender role attitudes and toys they were provided as children had an impact on their technical education or career choices. People could respond directly to the list or directly to me, if they felt uncomfortable sharing this publicly. 24 women participated in the discussion when I didn't include the BSRI.

5.3.1 Parental Support and Influence

Most of the 24 respondents used the public mailing list. They stated that they grew up in supportive households that recognized career opportunities for their daughters. They stated that they were encouraged to pursue university education in their chosen field. In certain cases, the women were the first generation to go to college or get a graduate degree. Below are some responses from women who grew up in supportive households, whose motivations find their roots in the domestic sphere of their childhood.

> *"I am the first in my family to graduate from college and I wasn't really expected to even go to college. My dad is an electrician for a major train company in Chicago and my mom worked managerial jobs here and there at small stores. My family expected me to be someone's secretary when I "grew up" because I could type fast... sigh. So my parents really played no role in choosing a university or a career. They still support me regardless of being a game designer or a secretary, though!"*

(CC email from 20/03/2013)

"My father went to school for Computer Science, decided he didn't like punch cards and bounced around before getting a degree in ICT (this only a few years ago) … He has been extremely supportive of everything I do and has been a wonderful support and balance to my mother throughout the years. He showed me why it's good to have time off and leave work at work.

My mother was the second after her sister to go to college in her family and got a degree in Electrical/Optical Engineering. She was one of three females in her degree and really made it easy to not even worry about the fact that I was the only female in my classes. And she worked on everything from Military Design to VR Headsets to Projection Televisions.

One of my earlier memories is playing with a prototype VR headset that had a game developed by MIT students. So I wouldn't be surprised if that helped me early on in my interest in games. She is also heavily influenced by art. She originally wanted to be an architect but couldn't afford classes and now my sister is going to school for architecture. I think their influence combined with experiences growing up playing Video Games helped shape the path I took. And I can't thank them enough for their support."
(DA email from 27/3/2013)

"My dad was a chemist and my mom had a bio(ology) degree. I was under the impression that they would have been very disappointed if we kids hadn't gone into one of the STEM fields. I (the oldest) ended up with a Computer Science degree, my sister has Biology and Computer Science degrees, and my brother has a Computer Science degree."
(ST email from 20/3/2013)

"My "mom" (legal guardian) was a hotel maid raising me as a single-parent. (Actually, being a maid is only one of the many minimum wage jobs she held simultaneously.) I wanted to be a programmer so I could make enough money to someday run for office and help poor families like the one I grew-up in. I followed the "cute guy" into game dev and discovered I had hidden talents there. After I started studying CS in college, my "mom" started taking computer classes at the local community college (going to college was her life-long dream as a child of the 40's). She earned her Associates Degree and was on the Honor Roll! So a child can actually influence a parent as well! Now I have 2 (half) sisters who want to work in games!"
(AC email from 21/3/2013)

"My parents both worked in retail while I was growing up (my dad sold shoes, my mom worked various positions at Kmart), but they also both went through a mid-life career change when I was in late high school/early college and both ended up becoming programmers. My dad had a degree in literature but had a casual interest in programming as a hobby, and my mom had been interested in programming since the 70s, but having four kids significantly slowed down her education, and it took her 13 years of night classes after my youngest brother was born to finally get her degree in computer science.

My parents were big on education, though, and I'm sure that always having a computer in the house throughout the 80s and early 90s while my dad programmed simple text-based games on the Atari 800 XL and my mom did her programming exercises for class must have influenced my career decisions to some degree. While I ended up going to college for animation, I always knew that I wanted to do art for games. My parents were very supportive of this (unlike my high school guidance counselor) and were the ones who told me about the game design classes at a local college that I would go on to attend after getting my art degree."
(MK email from 20/3/2013)

"I'm the first person in my family to finish college. My mom was an NSA analyst who left the workforce very early because of health issues. My dad just retired as a postal clerk. College was always expected of me because it was seen as the best opportunity for something better than what my parents had, but there was never any pressure to pick a specific major or go to a certain university. My dad's college advice was to pick a college that had many good programs, so that when I inevitably changed my major I'd have lots of options. :) Frankly, I never considered graduate school as an option at all until I was well into my undergraduate studies, and never looked at it seriously until I was in the workplace. (I have an MBA from Columbia.)

With my eldest daughter, I do see the influence of being exposed to lots of computers, science, and math. Her teacher proclaimed her the class computer expert (proud mom and AI programmer dad!), and she's very comfortable with technology. While she hasn't talked about specific careers, we have talked about game development, what people do, and how she might make games one day."
(MC email from 20/3/2013)

5.3.2 Hands-on, DIY Activities and the Influence of Working Mothers

Certain respondents began to see patterns in other women's responses like the importance of hands-on, do-it-yourself, or engineering-related play, as well as the frequent presence of supportive, working educated mothers. Hapnes & Sorenson (1995) found in their study of hackers[196] that the domestication of technology was achieved through tampering, and that this fostered a sense of the freedom and creativity through action and intervention. (p 181)

> *"I chose game making (not IT) and got into it as an artist. My father worked in sales and my mother was a math teacher. Dad's hobby was Do it Yourself and Woodworking. I believe that influenced my interest in "making things" (Making things was ALWAYS one of my needs growing up... mostly making toys and games for myself). I've worked in games all my adult life. My career path has DEFINITELY influenced my children's career. My son has been working as an artist in the digital game industry for the past seven years and, like me is also moving into both illustration and writing. My daughter aspires to be a writer of young adult novels. So, do parents' career choices influence their children? My anecdotal evidence says yes."* (J email from 20/3/2013)

> *"My parents were an industrial designer/architect (dad) and designer/artist and later an art therapist (mom), and a scientists/writer/fundraiser(stepmom)… I actually got into game design by accident through working for a friend of my dad's, working in the exhibits and theme park industries. My sister and I were raised in a very gender neutral way. We got Barbies and Hotwheels, toy horses and model cars. My dad took us go-cart racing and taught us how to change tires. So we got the message early on that girls could do whatever they wanted, which I think was super helpful.*
>
> *I also think exposure to the technical process of making something creative was important. We used to hang out in my dad's darkroom (he was also a photographer), my mom taught us how to silkscreen, and my grandmother*

[196] Hapnes, T. and Sorensen, K. H. (1995). Competition and collaboration in male shaping of computing: a study of a Norwegian hacker culture. In Grint, K. & Gill, R. (Eds.) *The gender technology relation: Contemporary theory and research*. London, Taylor and Francis.

taught us how to sew. I'll never forget going to the studio and seeing my grandfather work on the moviola. To me it was this magical gadget that was used to take a massive amount of film and turn it into a movie. He taught us how to splice and tape film. I also had a job as a kid (maybe 11?) working for my mom's boyfriend making demo tapes on a gigantic reel to reel tape recorder, which was a pretty high tech for the time. He also had a Moog synthesizer which he let us play with.

So we were exposed to a lot of different technologies and given the opportunity to mess with them from an early age. I think that probably had something to do with how I ended up this way.

In reading people's summaries, although parental backgrounds vary widely, but it seems like a more common thread among those who wrote in is not so much science, but engineering or engineering-like activities. My dad was sort of a self-made mad scientist, but what was interesting was that he always applied his science to something practical. It seems however like just early exposure to technology and the idea that you can make things with it might be more important than science per se."
(PC email from 22/3/2013)

"One thing I noted in the group of women who answered this topic is that almost all of the women had mothers who were in the workplace and most had jobs that required some education beyond high school. That in and of itself is an influence on you. I also noted the lack of parent professions that were strictly financial - most were engineering and helping professions. That squares with my experience in the industry and with the people I am most likely to be friendly with and socialize with outside of the industry."
(RE email from 24/3/2017)

I would agree that the diversity of technical activities considered as child's play had a positive, gender neutralizing influence. Reflecting on my own childhood, I had also grown up with a very hands-on approach to education with access to scientific equipment, top-end hi-fi systems and a black/white photography dark room. I made disgusting bacterial cultures to observe microscopic life forms. In addition to playing with Barbie, I learned to weld, maintain cars, and build furniture. My mother taught university chemistry, so university was never a question that we posed for ourselves. The only question we asked ourselves was the choice of which university major?

5.3.3 Rebellion and Resistance

Another interesting trend was that rebellious women tended to choose technical careers as a counterpoint to reactionary, unsupportive and constraining home environments. In these homes, female subservience to home and family was actively encouraged, and "masculine" subjects like math and science or professional ambition were disparaged. Technically competent, agentic women were not satisfied with the thankless submissive role proposed to them, and through hard work and stubbornness, they rebelled against their parents' docile aspirations.

> *"My father is extremely sexist and believes that women ought to stay home and make babies, so to speak. He would keep me from going to talented and gifted program trips for different careers because he didn't want me getting 'wrong ideas about working'.*
> *Anyway, he constantly put me down for my math/science/tech abilities. I really struggled with those types of things (only to find out in college I have a learning disability with math), and did well in my classes out of pure stubbornness to not fail like my father said I would.*
> *When I decided to go to college I really embraced computers as something my parents didn't allow in the home and became interested in games. I ended up going with an art path because of my own insecurities from my father's influence and my actual real problems learning programing concepts quickly. However, I feel like the reason my interest was so strong in games was because I was still wanting to go the exact opposite from my home situation… his opinions about what's wrong and right for women to do made me embrace games in my 'rebel' stage. (But I am doing it for myself now.)"*
> (JK email from 20/3/2013)

> *"My dad was an electronics engineer who ran a wholesale electronics distributorship, but … his attitude towards girls was "be a wife, subservient to your husband, yada yada yada yada."(Evangelical at its most hypocritical).*
> *He discouraged me from taking Latin and suggested typing instead. So if there is a correlation, I would offer it is only on the genetics side.*
>
> *My mom was a teacher (a good profession for a woman with two kids whose husband just walked out on her) and then a Christian Science Practitioner and CSB which, even though it has the word science in it, is*

nothing remotely scientific. Sort of like a Life Coach with spiritual healing tossed in on the side, though she'd reverse that order. So yeah, nothing encouraging there either.

BUT I was the rebel child so perhaps the genetic predisposition toward engineering coupled with growing up with a parent who said things like "you don't have a material head to ache" and "there is no cold in the warmth of love" when I had the flu and 104 degree fever led me to a path of logic."
(TJ email from 20/3/2013)

This belief in a genetic predisposition to engineering is interesting in TJ's response as respite from a difficult social context. However, her rebellious personality was surely a factor in providing the strength and motivation to stand up to her hostile domestic sphere which she recognized a hypocritical and sexist.

5.3.4 Nuanced Social Contexts

Some responses were more nuanced, achieving a balance between different levels of parental support or difficult social contexts:

"My dad was a former washing machine engineer who eventually ran his own business selling bearings and transmissions supplies to the industrial and agricultural sectors. My mother was a hairdresser (of dubious skill...) and former beauty queen with very traditional ideas about gender.

My dad was a huge influence on me - not in terms of his career influencing my own (although my brother went into the family business), but in terms of letting me figure out what I was good at and encouraging me to follow my dreams. When I got my exam results, he hugged me and said, "I never had any doubts you'd do well - you can do anything".
My mother generally makes jibes about my weight and fashion sense, thinks university is a waste of time unless you want to be a doctor or a lawyer, and says I would have been better off working in a bank or as a teacher... When I got my exam results, she looked amazed and said, "I always thought your brother was the academic one!""
(GL email from 20/3/2013)

“My father is an environmental engineer, though I've always known him as the corporate man in a suit who ran a company that quietly cleaned up after other companies contaminated water supplies. The only science part I can remember is many weekends playing with the Supercomputer in the lab surrounded by vials of dead fish.

My mom is a nurse. It was one of 3 options she was given or else she would have been on her own. Secretary and teacher were the other two. Had she been given the choice or confidence to make it on her own, I'm pretty certain she would have gone in an artistic direction. Hers was the biggest influence in my choosing the paths I wanted to go down that I got, "whatever makes you happy."

My father was mostly absent and not a decent person when he was around. However, it's obvious that he was an influence in me being a software engineer as well as the reason why I didn't accept that path until my 30's for anything other than a hobby. He was pretty deep into gender stereotypes and pushed my older brother into science with toys, games, and tech. I swear we had every science "toy" that came out in the 70's and 80's. All of which I'd use while my brother was out playing sports. So it did have an effect, but I was also naturally drawn to them from early age.”
(A email from 22/3/2013)

“My father was an electrician at a paper mill and my mother an LPN. The conversation was always about "when" you go to college, never "if". They wanted us to be well educated and weren't going to put up with anything less. My mother speaks well about feminism, but I have found out that she was surprised I listened. She really wants all of her 8 daughters to have kids, obey their husbands and stay at home. I didn't want my parent's life, so I worked hard to get out and build something I wanted. For me it was part motivation to have a different life than my family (as others have mentioned) and the encouragement of my parents to excel.
(BJ email from 20/3/2013)

One respondent chose to exchange personal emails with this story of parental support and childhood gender transgression in team sports:

“I'm a transwoman, which means a lot of my early childhood gender experiences are from a different angle. My parents were very gender permissive, though. I played in a sport that was formerly a girls-only sport and remained 99% female (Ringette)… Ringette was initially created as an all-girls sport in 1950 I believe. Sometime in the 1980s, there was a rule released in Canada that all sports must either be co-ed, or have a male division and a female division. There wasn't a boys Ringette, so they had to

allow boys who wanted to sign up onto the girls team. For my parents this was initially a convenience (I had two older sisters, so we would all be at the same ice rink, and gender in ice sports doesn't really matter when you're 4). But they probably weren't expecting me to stick with the sport until I moved away from home at 19 (while never staying interested in any of the other sports they signed me up for).

I would sew jewelry through beadwork, and my parents would buy beads for me. The one case where my parents enforced gender norms was that they had me lined up to be a ring bearer, and I wanted to wear a dress, and they told me no; they bargained with me to have a yellow tie instead."
(Anon. email from 12/2/14)

The women's testimony show that their choice of taking on a gender-transgressive education, discipline or career is one that may flow naturally from a supportive household but may also be an upstream defiance against a reactionary, anti-feminist family.

5.3.5 Toys and Games

As for the toys and anecdotes, most women grew up with access to a combination of high-tech, low-tech and traditional toys and games without any clear-cut boundaries against feminine toys like Barbie, construction toys like Legos (often labeled as masculine), or Nintendo and computer video games for the younger respondents. The low number of respondents to the BSRI does not permit any conclusions between gender role orientation and toy selection. Regardless of their sex-role orientation, perhaps women in game development's well-rounded activities and pastimes stand out that developed: gross motor skills through bike riding, horseback riding, gymnastics and dancing; engineering skills through construction games and video games; and fine motor skills through caring-taking of Barbie and Little Pet Shop figures. Quite a few women said they played with technical equipment like

computers, sound and music equipment, microscopes, chemistry sets, etc. Interestingly, not a single participant mentioned drawing and only one mentioned reading books – de facto calm, feminine pastimes - as a favorite activity.

5.3.6 Summary

Once again, 14 responses are too few to make any statistically valid statements concerning women in technology's sex role orientation. The slightly better results in my domestic sphere inquiry (24) are still too premature to develop pedagogic strategies to encourage women in STEM beyond: encourage girls to tinker and explore to their heart's content.

Women's diverse domestic contexts imply that regardless of the milieu one grew up in — even with sexist, unsupportive families— some women found the resilience to make their way into and thrive in a masculine profession.

M	F	A	Age	Birth-place	PSRO	Favorite Toy/Games	Anecdotes
38	72	60	31	CND	2	Metroid II, Sim Ant, Kirby's Dreamland, King's Quest series.	My parents were very gender permissive. I played in a sport that was formerly a girls-only sport and remained 99% female (Ringette).
46	62	63	25	UK	5	toy animals and video games (Nintendo console and handheld).	In the middle; 5. It didn't matter what toys I played with but the activities I engaged in included dancing and gymnastics.
53	57	57	36	US	1	games (board and video games), Legos, Hot Wheels, little rubber animals, stuffed animals	I did not like a lot of girl-oriented toys like Barbie or other female dolls. I liked my sister's Derrek(?) doll (he was a member of Barbie's band, the Rockers). However, I liked setting up my Lego sets (rarely building anything except what the instructions showed) and playing with them in doll-like scenarios.
56	43	51	28	US	3	biking, playing Super Nintendo (Mario & Donkey Kong), hot wheels, Barbies, Creepy Crawlers, chemistry set	
62	74	53	50	US	2	Riding my bike all over, exploring in the woods, being outside, playing baseball with my brothers (often), playing Jacks, Yahtzee, Rummy (Cards) with my Dad, Monopoly, other board games, jump rope, role-playing	I think they both wanted me to take more traditional female roles, but at the same time they promoted my own independence. There was a bit of dichotomy with my Dad. He raised me with the belief I could do anything that my brothers did and to be an independent thinker, but then he also wanted me to take more traditional female roles (cooking, cleaning, etc.). In the end, the independence training he gave me overruled his desires to have me take on more traditional female roles.
63	57	60	22	US	1	I played lots of video games, especially for N64 with Mario Party and GBA/GBC with many RPG games, when I was less than 12 years old. I barely played board games although my most favorite at that age was chinese checkers and connect 4.	1. Mom wants me to be very feminine with dresses, liking pink, liking to dance, modeling, not okay with sports etc. Dad is okay with me doing sports and doesn't mind with whatever I do despite being it sex-inappropriate.
71	53	54	32	US	3	Play-Dough, Legos, Gameboy (Marioland, Tetris, Home Alone, Tiny Toons, Teenage Mutant Ninja Turtles, Kirby's Dreamland, Warioland)! Snoopy Tennis. Tiger's Little Mermaid handheld electronic game. Breyer Horses (and other horses - My Little Ponies)	I never recall being told to not act like a boy, though I certainly was encouraged to do a lot of activities that happened to be feminine. It was never presented as being because they were girl things to do, however. (And I did get a GameBoy, but after my brother was born the gifts I received became more gendered).
73	51	51	38	US	5	Horses, dollhouses, My Little Pony, He Man.	
75	56	50	42	US	1	Clue, Monopoly, Dark Tower, flying kites, Trivial Pursuit, really early computer games like Night Driver, Pole Position, Zork	my parents never actively encouraged me to be gender-appropriate, but they also never discouraged me from playing with what I wanted to play with or do. My grandmother tried to get me to be more gender-appropriate with dolls and dresses, but my parents didn't do this.
76	70	64	33	Spain	**5**	I had gender-neutral games mostly. Also, I loved Barbies but also computers & games, so I kind of share both worlds.	I was a very feminine girl, in fact, and all my toys were girl-related. However, I used to play with my cousins (2 boys) so I started playing "most boy-related games" and my brother was born when I was six, so I always had exposure to all kind of toys.
76	60	68	30	US	3	Legos and action figures.	1 for my dad, 5 for my mom. My dad really just wanted me to do what made me happy. :) and being an architect he loved that I built things with Legos.

77	62	53	42	UK	1	Star Wars toys, lego, model cars & a toy garage, Manic Miner, Ant Attack, Tornado Low Level etc. on the Sinclair Spectrum.	There was no pressure to wear pink or play with dolls/makeup etc. ever, so I'd rate this as a "1" on the scale. At primary school I was occasionally mistaken for a boy (despite having longish hair!). My parents gave me lego, technical lego, a doll once when I asked for it (I later gave it to the family dog to chew), Star Wars figurines and toys etc. I was encouraged to use computers from the age of about 8 (1980!) - had a ZX81 which I "programmed" (badly) and used a BBC B to type & print homework from the age of 10 or so. I was encouraged to do science & maths subjects (though I also loved music, latin and english) and was pushed quite hard into science A-Levels and then an engineering degree (because it would give me the best prospects for a decent job).
78	53	53	35	Italy	2	Legos, barbies and barbies' clothes, books, board games (monopoly), the one transformer I had	I was mostly dressed in gender neutral clothes, I loved pink things and skirts but I had very few dresses or pink clothes. I had few toys, not as many as my friends, I mostly played outside (I lived in the countryside) My dad is a mechanic and I spent lots of time with him "working" on engines and playing in the garage I requested a Transformer for Christmas when I was about 7-8, my grandma tried to guilt trip me into changing my request, she failed, my parents still bought it for me, I loved that toy.
82	53	53	45	Belg.	1	Barbie (constructing for her), wooden building blocks, plasticine, horseback riding, gymnastics, swimming, board games, bike riding, building tents and hideaways	We had abstract wooden blocks in units from 1-10. I was so jealous of the Legos at our friend's house that I stole some Legos from her brother. My sister was yelled at for asking to be a nurse and not a doctor. Growing up in the seventy's there was no pink princess stuff, only rainbows, unicorns and synthetic fabrics. Got my hands on Pong at friend's house when I was 12. Loved it.

	Currently Androgynous but would previously have been considered Cross-sex Typed Masculine
	Androgynous
	Sex-typed feminine
	Cross-Sex typed masculine

Figure 5.3 BSRI values (masculine, feminine, androgynous), age, birthplace, rating of parents' sex-role socialization from 1 (unimportant) to 10 (very important), favorite toys and anecdotes of the 14 self-reporting women in game development that participated in the BSRI research.

6. Study 3: Children & Video Games: Gaité Lyrique Video Game Center

6.1 Reception: Research Program

Cooper and Weaver (2003) outlined research that shows how girls and women are disenfranchised when using computers in a public setting due to increased performance-related anxiety, reduced expectancy, and stereotype threat. If the objective is to bring more women into computer science, I determined that it would be useful to explore how gender stereotype affects games' reception by late elementary school children — before adolescent girls' disengagement with math and science. As chair and professor at Parsons Paris/PCA, I had already lead a few student projects with their education department before approaching them about doing ethnographic research in their "Learning to Play" after-school workshop. The Gaité Lyrique's video game center's open space design, with its clear glass enclosures, means that playing video games is very much a public performance. Has there been a change in how girls apprehend public video gaming in the 10-15 years since their research? Will the girls seek out the more hidden or private stations? How will they negotiate the sharing of gameplay and hardware? Does the gaming experience mitigate this anxiety-producing setting (Cooper & Weaver 2003; Jenson & de Castel 2010b & 2011)

I predicted beginner girls would behave in a timid manner, quick to hand-over the joypad when faced with a difficult obstacle, especially in mixed-sex groups. I expected

that they would seek out the most secluded game stations. I expected to find more beginners amongst the girls than the boys, since the children were of an age that might not have gaming hardware at home if parents or older siblings were not gamers themselves.

While I expected to find gender performance by the children - masculine aggressive domination and feminine submission - my observations were that their performance was nuanced, contextual and inconclusive. I expected displays of girls' anxiety from the public gaming context of the video game center's open space design, but this was a non-issue compared to their preferences for games playing on the different stations. I expected most children to have some experience with computers, game hardware, and/or touchscreen devices, i.e., an absence of absolute beginners, and this did pan out. Even self-declared beginners had access to their parent's smartphones or had computers in their homes.

However, the biggest takeaway from this research project was the initial questionnaire that highlighted the persistent gender-divide in access to games and hardware. Access is important because it can lead to experience, expertise, tech savvy and confidence. (Haddon 2004)[197] Harvey (2015) deconstructs notions of true domestic access when girls have to share equipment with other family members, and women have too much care-taking labor to meaningfully engage in gaming.[198] While many young boys had their own home video game consoles and games, girls were

[197] Haddon, L. (2004). Information and communication technologies in everyday life: A concise introduction and research guide. Oxford: Berg.

[198] Harvey, A. (2015). *Gender, Age, and Digital Games in the Domestic Context* (Vol. 3). Routledge.

occasionally given their own handheld consoles (3DS or PSP) or had to make do with their parents' smartphones, tablet, computers or the family's shared home video game consoles. Boys often had a significant number of titles at their disposal; a budget was allotted for game purchases. Not a single girl had her own home console. The games girls played were either free or low-cost casual games on web browsers or touchscreen devices like *Candy Crush*, *Temple Run,* or *Subway Surfer*. Girls with personal hand-held consoles had pink games purchased for them like *Movie Star Planet* or *Nintendogs*. A few girls played *Minecraft* on the family PC or family video game console. Not a single girl had parental time constraints on video gaming while most boys negotiated their game play through time limits. Girls were self-regulating and often stopped playing without being asked; it's easy to stop playing when a game is relatively monotonous or has built-in time constraints with free-to-play games. It's harder to stop when playing long, complex, immersive, challenging games. In other words, the constrained access to interesting technology, both hardware and software, meant the girls never had a chance to develop a passion for gaming, with two notable exceptions which will be discussed later.

In conclusion, reception–related gender stereotypes had less to do with children's gendered performance in the workshop than parentally-controlled gendered access—who supplied boys with equipment and a variety of games but made the assumption that gaming was either inappropriate or uninteresting to young girls. Spending time and effort on acquiring gaming experience and skill, made possible in the home by parental approval and family budget, seems to be encouraged only as a masculine pastime for these Parisian parents. Gender stereotypes seem to operate mainly in

parental attitudes and moral panic about technology's questionable threats or benefits for girls.

Due to the institutional context of my research, I was not able to speak to children's parents and had to rely on children's descriptions and explanations. Other researchers have focused on the domestic gaming context (Harvey 2015; Rufat & Al. 2013; Dajes & Rouscous 2010; Haddon 2004) that presents particular challenges for researchers due to the difficulty in finding willing subjects and its time-consuming interview methods that make large-scale studies unfeasible.

6.2 Methodology: Context and Research Plan

6.2.1 Context: ARE (Ateliers Récréatifs) in Paris 3rd Arrondissement

The context of ethnographic research has been found to influence its results. Carr (2005) found that gaming tastes are alterable and site–specific, influenced by gendered patterns of technological access and peer culture.[199] Therefore, the context of my study of elementary school children's video gameplay will first be explored.

Between April 2014 and June 2015, I engaged in an ethnographic study of children ages 9-11 that participated in an after-school recreational workshop called "Learning To Play" (*Apprendre A Jouer*) at the Gaité Lyrique's Video Game Center (GLVGC) in

[199] Carr, D. (2005). Contexts, gaming pleasures, and gendered preferences. *Simulation & Gaming*, *36*(4), 464-482.

Paris's 3rd Arrondissement. (Krupa 2015). The Gaité Lyrique is a state-of-the-art cultural center dedicated to new media, street culture and contemporary music that opened in the center of Paris in December 2010.

With the new French 5-day elementary school schedule implemented in Fall 2013, Parisian elementary schools end the day early on Tuesdays and Fridays at 15h00 rather than 16h30. Parisian elementary school children who remain in school after 15:00 on Tuesdays and Fridays can select free afterschool activities from a selection elaborated by and funded by the *Mairies* (town hall) of each *arrondissements* (district). This school week schedule change was instated by a socialist national government (Education Minister Vincent Peillon decree n° 2013-77 24/01/2013), and unanimously adopted by socialist local government representatives:

- The City of Paris (Mairie de Paris) - socialist mayors Bertand Delanoe (2001-2014)/Anne Hidalgo (2014-) - and
- The Mairie of the 3rd Arrondissment (Mairie du 3eme Arrondissment), socialist mayor Pierre Aidenbaum (1995-)

A large majority of Parisian schoolchildren stay for these afterschool workshops, known as AREs, short for "Ateliers Récréatifs" 'or *recreational workshops*) Opposition mayors who feared the costs of the afterschool programs, teachers unions, and a minority of parents heavily criticized the implementation of the new school week schedule. Conservative opposition parties, primarily the UMP/Les Republicains,

exploited the debate to weaken the Socialists, and socialist mayors responded by showing how well this system could work with the good-will of administrators.[200]

Therefore, children picked up by parents or guardians at 15h00 on Tuesdays or Fridays do not participate in the AREs. How this might influence the demographic diversity of ARE children is difficult to determine, but elementary school children who leave school at 3:00 PM either have a parent or caretaker available, which might indicate a stay-at-home, work-at-home or unemployed parent or family member, or hired help. One could speculate that these early-departure children would form distribution-curve extremes of children's parental attention, financial stability, and/or disenfranchisement.

Parents who belong to conservative opposition parties might also be part of the early-departures, since their argument in the ensuing debates was that their children would be tired from 3 extra hours of school presence on Wednesday mornings. (Never mind that French children used to have 3 hours of school on Saturday mornings up until 2008.)

Based on the questionnaires distributed to students, the vast majority of my research subjects are growing up in dual-income households. This is not surprising considering other constraints affecting the diversity of school children in central Paris: zoned school districts and high housing costs.

[200] In 2017, Emmanuel Macron's center-right minister of education Jean Michel Blanquer allowed local institutions to decide how to organize their weekly school schedules. As a result, conservative and poor, often rural, districts abandoned the ARE while they remain in force in left-leaning urban districts.

In Paris, the public preschools, elementary schools and junior high school are designated according to a child's home address Participating schools are within a short walking distance of the Gaité Lyrique, which practically guarantees that the workshop participants live within a short walking distance of the Gaité Lyrique. Since real estate in the center of Paris has become prohibitively expensive over the past 15 years, the childrens' socio-economic composition tends to favor both the working classes who have historic roots in the neighborhood (parents working in wholesale garment and service industries, and in public housing) and wealthier professional/managerial classes who can afford high real estate prices. Amongst the parents, there is a surprising absence of middle class professions and civil servants.

To participate in the ARE workshops, students select 3 activities for each day (Tuesday and Friday); activities are attributed in order of preference when possible. It is therefore highly likely that participants selected the workshop rather than attending by force or by default and increases the chances that the children are fans of video games or have prior experience with them. In my first observation session (from Sept.-Dec. 2014), I did get one boy, Evan, who as assigned to the *Learning to Play* workshop against his will because his first three activity choices were full; we will discuss Evan's case later.

The first ARE session of the school year (i.e., my second observation session from September-December 2014) was made up of students who chose the video game workshop as their first choice activity, resulting in a boy:girl ratio of 13:2 in the Tuesday group. While boys numerically outnumbered girls in all six sessions, the number of girls increased as the school year progressed, not so much from word of

mouth, but rather due to the video game workshop's second or third place activity choice.

My first observation session (April-June 2014), i.e., children's third choice activity, yielded some very interesting outlying cases: passionate girl gamers which will be discussed later in this chapter.

6.2.2 Context: the Gaité Lyrique

The Gaité Lyrique, a digital arts, music and street culture center, opened in December 2010 in Paris's 3rd Arrondissement, and is funded by the city of Paris. The Gaité Lyrique is housed in the renovated space that was formerly the Theatre de la Gaité (built in1862 by Hirtoff and Cusin). The old theatre specialized in *operetta*, a form of musical theatre aimed at large, popular audiences. Jacques Offenbach was its director from 1873-74. The theatre languished in the early 20th Century. In the 1980s, the building was largely gutted and transformed into an indoor amusement park called *Planète Magique*, by *Inspector Gadget's* creator Jean Chalopin. The historic main auditorium and the orchestra pit were destroyed. The ill-fated amusement park closed after just a few weeks — squandering not only 61 million euros but also most of its historic interiors. (Krupa 2015).

Figure 6.1. Historic entrance and foyer renovated by Manuelle Gautrand Architects © Philippe Ruault/Gautrand

Financed by the city of Paris, the 85 million euro renovation by Manuelle Gautrand Architectes (2003 to 2010) restored the historic façade, entrance and foyer. Gautrand conceived the cultural center as a series of high tech multi-functional plateaus or “toolboxes” (Krupa 2015). It is a total work of art in the avant-garde tradition, including movable floor and wall elements, down to the custom-made, combinable multi-purpose units, called "éclaireuses" and white dodecahedral pods that form desks and wall dividers around the center.

The new Gaité Lyrique is a contemporary cultural center for the general public, and the bulk of its visitors are between the ages of 15-50, a slight majority of males with a demographic make-up similar to the rest of French society. What unites its core audience is an understanding, appreciation, and respect of digital and street culture’s value, otherwise known as “nobrow” culture (Seabrook 2001): skateboarding, graffiti, and contemporary music. Nobrow culture rejects high/low culture’s traditional obsession with quality in favor of authenticity. Nobrow culture does not reject something in popular culture out-of-hand because they believe commerce and art do not need to be mutually exclusive. A nobrow audience thinks of culture as a selection process that accrues to form one’s identity, resulting in membership in multiple

subcultures; a nobrow audience curates culture to create individuality. For example, a person can identify themselves as a designer, parent, surfer, gamer, and fan of contemporary dance and electronic music. These different self–identified traits mix culture and consumerism seamlessly.

Figure 6.2 Front desk leading to the video game center and "eclaireuses" in the library by Manuelle Gautrand Architects © Philippe Ruault/Gautrand

6.2.3 Context: Video Game Center's *Learning to Play* Workshop

On the first floor, a large resource center/library specializes in digital art, contemporary music, new art technologies, video games, dance, set design, street art, skating, and graffiti. Glass and metallic mesh panels separate the library from the video game center where the "Learning To Play" workshops are run by the video game center's two video game experts, Oscar Barda and Theo Kuperholc. Both are cisgender white males in their 20s. Oscar, the center's manager, has a background in architecture but now works as a game designer. Theo's background is in English literature. Each week, they devise a program that encourages the children's introspection on the meaning of games and how they are produced.

Each ARE trimester lasts 14-16 weeks. Over the course of a school year, three different sessions of kids participate on Tuesdays and Fridays. I therefore followed six different groups over the course of a year: 3 groups on Tuesday and 3 groups on Friday. A few kids requested the workshop for a second session in the final trimester and were allowed to return due to available spots. The kids came from two small neighboring elementary schools.

Each group was comprised of 15-18 students with grade levels that ranged from 3rd grade (CE2) to 5th grade (CM2). This minor difference in grade level had unexpected effects in team dynamics that I will explain later in this chapter.

The video game center has 7 stations made from Manuele Gautrand's "eclaireuses." Public gaming spaces (Fig. 6.1-4) Lack of individual stations meant that students had to work in teams of two or three, and team composition was something that I either directly influenced or requested from Theo, who composed the groups. The groups were never self-defined, though problematic groups were reorganized within the first few weeks.

Figure 6.3 Entrance to the Gaité Lyrique Video Game Center, public gaming spaces. ©Vinciane Verguethen

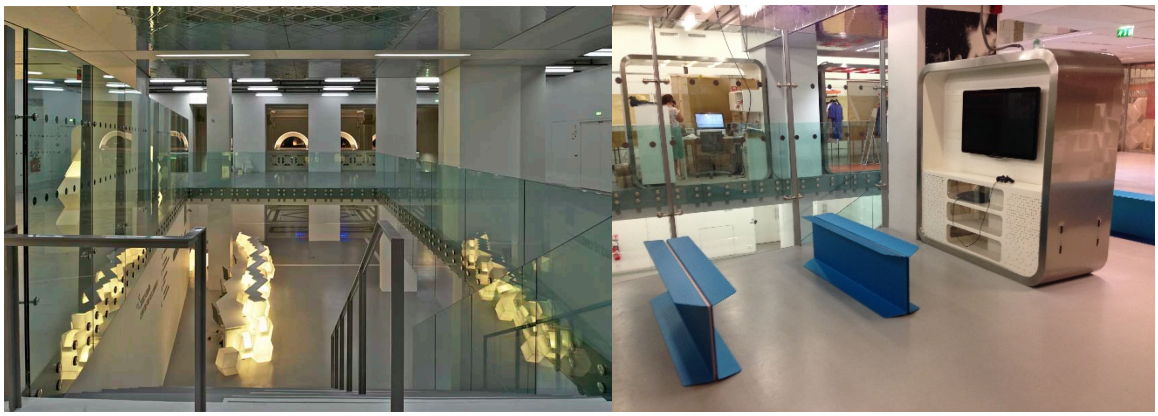


Figure 6.4A Stairwell leading to the video game center and view from within the center towards the stairs. View of the glass wall enclosure of the center.

Figure 6.4B GLVGC's video game stations, with Hoffner and Hemsedine's anodized aluminum furniture.

We tried to avoid single-sex groups but it wasn't always possible because more boys had signed up, especially in the first ARE session for a school year. The participation of girls increased in the second and third trimester, when the Learning to Play Workshop was a second or third choice activity. In the April-June group, we even allowed an all-girl trio.

One element that was underestimated was that age would trump gender in determining group composition. For example, an 11 year old girl preferred being in a group with 2 very aggressive male gamers her own age rather than being in a group with a girl two years younger than her and a sweet but unpopular boy her age. This surprised us greatly, since we assumed she would prefer being in a calmer group. Faced with her adamant, repeated requests, we switched her to the new group with the two aggressive gamers. Subsequently, she stopped requesting a group change but

clearly had less gaming opportunities with two boys who loathed sharing gameplay with her.

6.2.4 De facto Gender-Neutral Video Games

Gaité Lyrique's video game center offers a game selection chosen among current and older independent games titles. The criteria for selecting games playable in the game stations is based on the constraints of:

- Its location: Due to the open-plan resource center, sound must be kept to a minimum so music and sound games are rarely enjoyed at optimal volumes.
- Length of play: In a short session, it is necessary to quickly understand how to interact with the digital world and the game's objective.
- Accessibility to the general public: Weekly sessions are held for children and seniors so graphic sexual or violent content is proscribed.
- Educational mission: Since the goal is to spotlight relatively unknown games, innovative titles that have achieved significant market success like *Minecraft*, *Portal*, *Little Big Planet* or *Mario* series rarely appear unless they are part of a theme. Game selections were sometimes curated to accompany an exhibition or events at the Gaité Lyrique, such as sound games to accompany an exhibition on Parisian digital music culture.

These constraints mean that the video game genres favored by the center are more often casual, puzzle and arcade games to avoid potentially offending audiences and reinforcing video game and gamer stereotypes. The video game center's selection of

game titles often came at the expense of well-known games or those with expansive narratives that cannot be fully appreciated in short play sessions.

This also means that the center's game selection was de facto gender-neutral without overtly striving to accomplish this. By virtue of its educational mission, the relatively unknown games with artistic and narrative originality framed gaming squarely against the masculine subject position that we associate with hard-core gaming and AAA titles. Figure 6.6 lists game titles that were on high rotation in 2014-2015, due to their aesthetic originality and accessible gameplay that avoided gendered subject positions or subject matters, unless specifically addressing them such as in the time-bending game such *Braid*. As the gameplay concludes in *Braid*, we discover that the princess we are trying to save is not being held captive by the monster but running away from *us*, the stalker "hero," with the monster's help. Our sexist "heroism" is put in stark contrast to creepy, obsessive behavior that ignores the princess's agency or consent.

Fig. 6.5 Braid, by J. Blow (2008), ending scene of the "hero" revealed as stalker.

Title	Platform	Year	Category	Developer
Back to Bed	Steam	2014	3D puzzle	Bedtime Digital Games
Beautiful Katamari	Xbox 360	2007	3rd person action puzzle	Namco Bandai Games
Boson X	Windows	2013	Rotational runner with particle accelerator theme	ian MacLarty
Botanicula	Windows	2012	Point and click adventure game	Amanita
Braid	Xbox 360	2008	Puzzle game	Number None
Catlateral Damage	Steam	2013	First person cat simulator	Fire Hose Games
Chime	Xbox Live	2010	Music and puzzle game	Zoe Mode/OneBigGame
Derrick the Deathfin	PS3	2012	Arcade game	Different Tuna
Dream Machine	Windows	2010	Point and click adventure (puzzle and object collection	Cockroach Inc.
Eufloria	Windows	2009	Real-time strategy game	Omni Systems Ltd.
Fez	Xbox 360	2012	2D puzzle game in a 3D world (4 sided)	Polytron
Flow	PS3	2007	2D scroller, art	Thatgamecompany
Flower	PS3	2009	Art exploration	Thatgamecompany
Fotonica	Windows	2011	Runner	Santa Regione
From Dust	Windows	2011	God game	Ubisoft Montpellier
Gone Home	Windows	2013	Adventure exploration	The Fullbright Company
Hohokum	PS3	2014	Art exploration	Honeyslug
Insanely Twisted Shadow Planet	Xbox Live	2011	Shooter/exploration/puzzle game	Shadow Planet Productions
inSynch	PC	2014	Musical arcade game	Them Games Studio
Journey	PS3	2012	3D artistic game	Thatgamecompany
Kami	iOs	2013	Origami puzzle and sandbox game	State of Play
Limbo	Xbox	2010	2D side-scroller horror puzzle	Playdead
Monaco	Windows	2010	Stealth action video game	Pocketwatch Games
Monument Valley	iOs	2014	Puzzle game	Ustwo Games
Never Alone	PS3	2014	Puzzle platformer adventure game	Upper One Games
Over the Void	Steam	2014	3D platformer	Exquisite Games
Platypus 2	Steam	2007	Shooter arcade Action Shoot'em Up	Squashy Software
Puppeteer	PS3	2013	Side-scrolling platform video game	SCE
Quantum Conundrum	PS3	2012	Puzzle-platformer	Airtight Games
Race the Sun	PS3	2013	3D runner	Flippfly
Rain	PS3	2013	Adventure	Acquire/Sony Japan
Sound Shapes	PS3	2012	Musical side-scrolling platformer	Sony
The Bridge	Windows	2013	Puzzle art	The Quantum Astrophysics Guild
Unfinished Swan	PS3	2012	Adventure exploration	Giant Sparrow

Figure 6.6 Selection of independent video games on high rotation in the Gaité Lyrique Video Game Center, 2014-2015.

Stereotypes about “state of the art video games” form a continuum with gamer geek stereotypes: AAA video games with large development and promotional budgets aimed at young men on high-end gaming consoles. AAA games like Grand Theft Auto V, Assassin’s Creed IV, Call of Duty (11 major releases), or FIFA 15 tend to push photorealism and favor predictable sequel-based intellectual property. AAA games’ aesthetics are often judged by how realistically they achieve visual effects, such as hair, cloth, shadows, water, glare, facial expressions, etc. This quest for photorealism is labor-intensive and expensive. Violence and adult content are usually associated with the stereotypical AAA titles, and masculine genres such as first-person shooters (FPS), sports and racing games tend to overshadow the more gender-neutral and innovative genres like sandbox, arcade or puzzle games. AAA games take hours to complete and may not be obvious to pick up for 10 minutes of casual gameplay.

Independent games both reinforce the concept of games as art and broaden the audience for video games. Independent games can afford to be more experimental in both gameplay and aesthetics because high investments in AAA titles rivaling Hollywood blockbusters tend to encourage safe, formulaic game licenses that have already proven successful and have found their (mostly male) audience. Successful independent games are usually made with smaller teams and budgets and tend to emphasize a game’s aesthetics using innovative styles such as stop-motion, cartoon rendering, pixel art, collage or film noir that make economical use of the limited production teams. Independent games often take more risks in narrative structures, gameplay, and mixing/creating new game genres.

The center's artistic indie game selection demarcates this research from other studies of after-school video game clubs that provided more commercial titles. A major advantage to this approach is that experienced players were confronted with games that they had never played before, so all team members discover a game together without having an advanced user dominate the team's gameplay through expert knowledge. Experienced players had the advantage of gamepad muscle-memory and eye-hand coordination, but that was about it. This leveled the playing field for beginners significantly.

6.2.4.1 Gamers versus Newbies

The other major advantage to group discovery of unknown indie titles was that it expanded the students' definition of gaming beyond AAA games played on major home consoles or high-end gaming computer as the only legitimate expression for a real gamer. On a few occasions, boys said they had no gaming experience because they did not have a home console or a computer; however, they played on shared touchscreen and handheld consoles and could name their favorite complex online games on those "secondary" platforms. They still deemed their gameplay to be illegitimate for claiming "gamer" status.

Girls' refusal to claim gamer girls status brings up a different set of issues. On one hand, girls who faced the same access constraints to shared touchscreen devices and free internet and casual games also considered their gaming as inauthentic. But the masculine gendered position of the anti-social gamer serves as a second deterrent, regardless of the girl's gaming skills. Experienced girls did not brag about their skills and trash-talk other players; they continuously undersold their skills and capacity.

6.2.5 Research Method: the Known but Discreet Observer

When I first approached the video game center's director at the Gaité Lyrique to broach the subject of my ethnographic research, I avoided the mention of gender. I spoke about researching "children and technology" because in France, the word "gender" has potentially confrontational and erroneous connotations fostered by religious, conservative groups that unify themselves around a reactionary protest movement called *Manif Pour Tous* (MPT). "Gender" using the English spelling in French has distorted meanings aligned to MPT's reactionary and homophobic discourse. Therefore, I wanted to avoid any polemic around a potentially misunderstood concept. As time went on, my colleagues at the Gaité Lyrique's Education and Video Game Center became supporters and allies of my feminist research.

My position as researcher was as a known but discreet observer. I explained to the kids in my first session that I am a designer and researcher working on a PhD on children and video games. I told them that playing is a very important activity for children, so important that other mammals like dogs and cats also use play to educate their young. I mentioned I was a parent with children close to their age, and that playing video games is an important activity for my entire family, myself included. This comment meant to reassure them that I was not adopting a stance of moral panic, a position that they might be getting from adults at home. I explained that my role was to observe children playing video games and that I might ask them some questions. Children sometimes asked what I was going to do with this research.

I explained that I would produce a very long paper to explain that games are an excellent way to learn but that we need to know more about what makes play enjoyable. I mentioned to the kids that I would keep a notebook with me but regardless of what I wrote down, their names or anything that could identify them would never appear in my paper. I kept my word, and their names have been changed in this dissertation.

The discreet observer element is that I never mentioned to them that I was looking at gender performance so as not bring forth any gender and gamer stereotypes. What was particularly enlightening is that over the course of a year, on only two occasions – during workshop debriefing on the last days of the sessions - did I hear the phrase, "that game is for boys," or "that game is for girls."

My age and parental status made me an automatic authority figure, though I delegated authority as much as possible to Theo and Oscar, or an adult workshop facilitator. I wanted to keep my role as the neutral researcher, separate from the other adults. I avoided touching the game controllers in their presence but would talk them through obstacles when I knew the solution. However, it was apparent that as they became more comfortable with me they often forgot that I was a researcher and would ask me for help on their questionnaires about game design or on the video games themselves, and would initiate casual conversations with me.

Whenever I would talk individually to a child about their video game experience, especially the ones that belonged in a category that I refer to as the experienced, hardcore players – those that have been playing from a young age and claim to play around three or more hours a day – I would explain the benefits of video games

(Green & Bavelier 2007, 2011, 2012, 2017; McGonigal 2011) and discuss their favorite games with them in detail so that they wouldn't assume that I was an adult preaching about the dangers of video game consumption. The children who were initially hesitant to talk, quickly warmed up to me because here was an adult that really wanted to talk about their passion without judgment or hysteria.

Even when their answers potentially surprised me, I did not make any negative value judgments. On several occasions, an adult workshop facilitator (who escorted the children to and from school) interrupted our discussions by issuing negative comments about excessive video game playing. This afforded me the opportunity to politely defend video games' beneficial effects and highlight/put a positive spin on the child's extensive experience. This optimistic and defensive intervention had a beneficial side effect of reinforcing my credibility with the kids.

6.2.6 Learning to Play Workshop Sessions

A typical *Learning to Play* session consisted of the following steps:

1. On the first session, groups of 3 children were formed by Theo. Students arrived all together and sat on the floor with their friends rather than their group mates. I was seated behind the kids, away from Theo and/or Oscar who stood in front of the group.
2. Groups were called to come forward by Theo or Oscar. One student per group was handed a clipboard and questionnaire. The three group members then huddled together to go over the questionnaire.
3. The questionnaire was discussed/explained as a group.

4. Then the groups would get up and choose a video game station by running and occupying a bench.
5. Theo or Oscar would hand out a pen to the person holding the clipboard and turn on the screens of the video game stations that had the game that they wanted to play, either a new game or because they had enjoyed it before.
6. One child would begin playing the game, one child would hold the clipboard and begin working on the questionnaire and one child either helped the person playing, helped answer the questionnaire or would disconnect from the group. The group dynamics - who played first, second or third; who played a lot, a little, or not at all; who was dominant or submissive; who was popular and confident; who was in a lower social pecking order; who had experience and/or passion - was a very complex system that played itself out week to week.

Each step was an opportunity for some form of chaotic behavior, and it would require much admonishment to maintain their attention on the task at hand. Theo and Oscar frequently showed a disciplinarian streak, not hesitating to drag out step 3 to keep the kids from getting to play the video games as a form of punishment. Individual offenders might be sent to the comically entitled "*pouf des lourdos*" (the pest's seat) to calm down for the remainder of the session.

To break the ice with children that might be hesitant to speak to me, I often brought the plastic seat next to their benches mentioning it was my turn to sit on the *pouf des lourdos*. This was an ideal icebreaker since the slang terms coming from the mouth of an older adult often made them laugh. It also allowed me to be at eye level with them

rather than standing behind or next to them with my notebook. If the *pouf des lourdos* was not available, I would crouch next to them to be as unintimidating as possible and to speak as quietly as possible.

Aside from my one questionnaire that the students filled out individually on their second or third session, that asked them about their video game experience and demographic information, all other questionnaires were standard Learning to Play workshop exercises that sought to make the children step out of their immersive experience and analyze some aspect of game design or gameplay. The two Tuesday and Friday groups from each trimester workshop session (April-June 2014, Sept-Dec. 2014 and Jan-June 2015[201]) received identical questionnaires, however for each session we distributed a different questionnaire based on questions that returned imprecise answers or in the hopes of eliciting answers that were more specific and not inspired or copied from groupmates.

Each session, I would make a spreadsheet to look for patterns in their questionnaire answers in order to bring up topics of discussion and questions for the following weeks.

The last session — which should have run from January-March 2015 — was forced into a six week hiatus starting in the middle of the workshop's first week because on Wednesday January 7th, 2015, Paris's first terrorist attack occurred. Two gunmen attacked the satirical weekly *Charlie Hedbo* situated a few kilometers from the Gaité Lyrique, and a third shooter began a rampage on the South side of Paris the following

[201] Scheduling affected by state of emergency from the January 7th Parisian terrorist attack.

day. School children in the Parisian suburb of Saint Mandé found themselves barricaded in their school during a long stand-off with a deadly hostage situation in a kosher supermarket across the street from the school. A state of emergency was immediately implemented that cancelled all school trips and outings in France until further notice. Security was intensified in schools and public venues.

We had already met the winter trimester Tuesday group once, but the Friday group could not leave school to attend the first day of their workshop. We waited six weeks for school outings to be re-established – four weeks of state of emergency followed by the 2 week winter school holidays. In the end, the ARE's second trimester was only a few weeks long. Quite a few students chose to stay on to the third spring session (April-June 2015), and they were removed from the subject count for redundancy's sake. The winter and spring 2015 school children all took the third questionnaire. This is why the Winter/Spring 2015 session is treated as one group.

	Session Apr-June 2014 Spring Trimester		Session Sept-Dec 2014 Fall Trimester		Session Jan-June 2015 Winter/Spring Trimester		TOTAL PER SCHOOL	
Tuesday	Female	9	Female	2	Female	12	Female	23
	Male	7	Male	14	Male	16	Male	37
Friday	Female	3	Female	6	Female	7	Female	16
	Male	13	Male	8	Male	13	Male	34
Total Per Session	Female	12	Female	8	Female	19	Female	39
	Male	20	Male	22	Male	29	Male	71
	60% female		36% female		65% female		TOTAL	120

Figure 6.7 Number of research subjects by sex, by ARE group and session.

6.2.7 Addressing Sex, Gender and Intersectionality in the ARE Workshops

The questionnaires did not include questions asking the students to self-define their sex or gender because we did not want to make the sex/gender dichotomy or its stereotypes salient in the minds of school children. Why are the children categorized as such in the table above? Assigning them to a dichotomous sex category does not mean that they self-define as boys and girls. I established the sex classifications in the chart above through repeated interaction with the children, their choice of clothing, and their performance regarding masculinity and femininity. While I saw some clear gender transgressions in the student's performance – tomboys and sissies[202] as defined by Barrie Thorne (1993) — I did not observe transgender or intersex identities in this group using the criteria above, perhaps due to their relatively young age. I kept the binary categories not because I adhere to them. I kept them because I did not want to negate the potential social privilege bestowed on children by virtue of their interpreted sex.

As previously mentioned, recording someone's religious, ethnic or racial group in database is illegal in France in most circumstances and makes intersectional research extremely complicated and tightly controlled by law.[203] I did not ask or interpret religious or ethnic backgrounds; however, the demographics of the neighborhood is such that it is largely composed of long-established Jewish, African, Arab and

[202] Thorne, B. (1993). *Gender Play: Girls and Boys in School*. Rutgers University.

[203] https://www.cnil.fr/fr/statistiques-ethniques-quel-cadre-legal

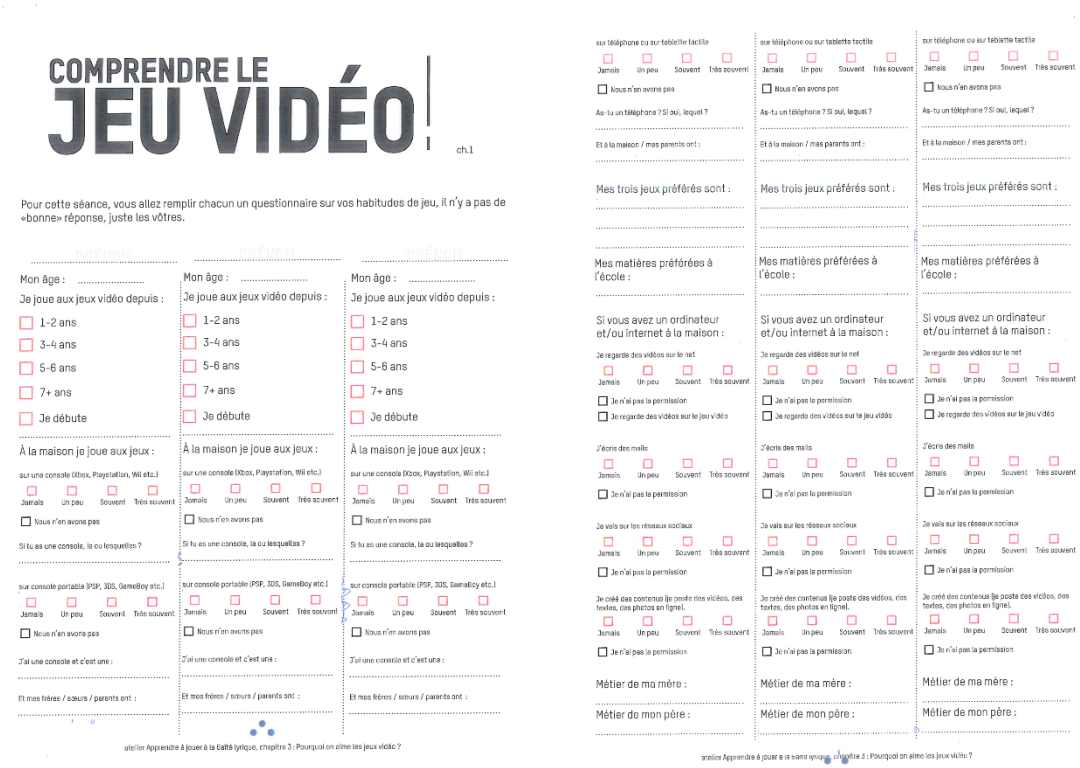
Southeast Asian communities. While coming from extremely divergent social classes, the students were more ethnically diverse than the general French population.

6.2.8 Questionnaire Design & Session 1: April-June 2014

My first observation session was the school year's third ARE workshop for the elementary school students. Often this corresponded to a student's third choice of ARE activity. This resulted in an increase in the number of girls who had chosen other workshops for the previous trimesters (see Figure 6.7).

I sent my initial student questionnaire to Theo who redesigned it to fit on a single sheet for the 3 group members; each child had a column to fill out. (See the appendix for large-scale examples of the different questionnaires in French).

Theo had reworked my researcher's language to achieve a hipper, more casual tone.


COMPRENDRE LE
JEU VIDÉO !
ch.1

Pour cette séance, vous allez remplir chacun un questionnaire sur vos habitudes de jeu, il n'y a pas de «bonne» réponse, juste les vôtres.

Mon âge :
Je joue aux jeux vidéo depuis :
1-2 ans
3-4 ans
5-6 ans
7+ ans
Je débute
À la maison je joue aux jeux :
sur une console (Xbox, Playstation, Wii etc.)
Jamais Un peu Souvent Très souvent
Nous n'en avons pas
Si tu as une console, la ou lesquelles ?
sur console portable (PSP, 3DS, GameBoy etc.)
Nous n'en avons pas
J'ai une console et c'est une :
Et mes frères / sœurs / parents ont :

Mon âge :
Je joue aux jeux vidéo depuis :
1-2 ans
3-4 ans
5-6 ans
7+ ans
Je débute
À la maison je joue aux jeux :
sur une console (Xbox, Playstation, Wii etc.)
Jamais Un peu Souvent Très souvent
Nous n'en avons pas
Si tu as une console, la ou lesquelles ?
sur console portable (PSP, 3DS, GameBoy etc.)
Nous n'en avons pas
J'ai une console et c'est une :
Et mes frères / sœurs / parents ont :

Mon âge :
Je joue aux jeux vidéo depuis :
1-2 ans
3-4 ans
5-6 ans
7+ ans
Je débute
À la maison je joue aux jeux :
sur une console (Xbox, Playstation, Wii etc.)
Jamais Un peu Souvent Très souvent
Nous n'en avons pas
Si tu as une console, la ou lesquelles ?
sur console portable (PSP, 3DS, GameBoy etc.)
Nous n'en avons pas
J'ai une console et c'est une :
Et mes frères / sœurs / parents ont :

atelier Apprendre à jouer à la Salle lyrique, chapitre 3 : Pourquoi on aime les jeux vidéo ?

sur téléphone ou sur tablette tactile
Jamais Un peu Souvent Très souvent
Nous n'en avons pas
As-tu un téléphone ? Si oui, lequel ?
Et à la maison / mes parents ont :
Mes trois jeux préférés sont :
Mes matières préférées à l'école :
Si vous avez un ordinateur et/ou internet à la maison :
Je regarde des vidéos sur le net
Jamais Un peu Souvent Très souvent
Je n'ai pas la permission
Je regarde des vidéos sur le jeu vidéo
J'écris des mails
Jamais Un peu Souvent Très souvent
Je n'ai pas la permission
Je vais sur les réseaux sociaux
Jamais Un peu Souvent Très souvent
Je n'ai pas la permission
Je créé des contenus (je poste des vidéos, des textes, des photos en ligne).
Jamais Un peu Souvent Très souvent
Je n'ai pas la permission
Métier de ma mère :
Métier de mon père :

sur téléphone ou sur tablette tactile
Jamais Un peu Souvent Très souvent
Nous n'en avons pas
As-tu un téléphone ? Si oui, lequel ?
Et à la maison / mes parents ont :
Mes trois jeux préférés sont :
Mes matières préférées à l'école :
Si vous avez un ordinateur et/ou internet à la maison :
Je regarde des vidéos sur le net
Jamais Un peu Souvent Très souvent
Je n'ai pas la permission
Je regarde des vidéos sur le jeu vidéo
J'écris des mails
Jamais Un peu Souvent Très souvent
Je n'ai pas la permission
Je vais sur les réseaux sociaux
Jamais Un peu Souvent Très souvent
Je n'ai pas la permission
Je créé des contenus (je poste des vidéos, des textes, des photos en ligne).
Jamais Un peu Souvent Très souvent
Je n'ai pas la permission
Métier de ma mère :
Métier de mon père :

sur téléphone ou sur tablette tactile
Jamais Un peu Souvent Très souvent
Nous n'en avons pas
As-tu un téléphone ? Si oui, lequel ?
Et à la maison / mes parents ont :
Mes trois jeux préférés sont :
Mes matières préférées à l'école :
Si vous avez un ordinateur et/ou internet à la maison :
Je regarde des vidéos sur le net
Jamais Un peu Souvent Très souvent
Je n'ai pas la permission
Je regarde des vidéos sur le jeu vidéo
J'écris des mails
Jamais Un peu Souvent Très souvent
Je n'ai pas la permission
Je vais sur les réseaux sociaux
Jamais Un peu Souvent Très souvent
Je n'ai pas la permission
Je créé des contenus (je poste des vidéos, des textes, des photos en ligne).
Jamais Un peu Souvent Très souvent
Je n'ai pas la permission
Métier de ma mère :
Métier de mon père :

atelier Apprendre à jouer à la Salle lyrique, chapitre 3 : Pourquoi on aime les jeux vidéo ?

Figure 6.8 Example of the first questionnaire for April-June 2014 (see appendix for large scale version)

The questions requested on the front of the form:

- First name
- Age
- I have been playing video games: 1-2 years, 3-4 years, 5-6 years, +7 years, I am beginning
- At home, I play on a home console: never, a little, frequently, very frequently, we don't have one
- At home, I play on a portable console: never, a little, frequently, very frequently, we don't have one
- I have a game console and it is a:
- My brother/sister/parents have: never, a little, frequently very frequently, we don't have one

Back of the form:

1. I play on a phone or touchscreen tablet: never, a little, frequently, very frequently, we don't have one
2. Do you have a phone and if yes, what kind?
3. And you parents?
4. My three favorite games are:
5. My favorite subject at school:
6. If you have a computer or internet at home:
    - I watch video on the net: never, a little, frequently, very frequently, I am not allowed, I watch videos on video games

- I write emails: never, a little, frequently, very frequently, I am not allowed
- I go on social networks: never, a little, frequently, very frequently, I am not allowed
- I create content (I post videos, text, photos online): never, a little, frequently, very frequently, I am not allowed

7. Mother's profession
8. Father's profession

6.2.8.1 Shared Questionnaire and Gender Posturing

First I'll discuss the repercussions of using a 3-column shared questionnaire, followed by semantic and design considerations that could incite people to exaggerate or answer inaccurately.

The shared questionnaire prompted a lot of copy-cat answers especially from kids who might be ashamed to publicly acknowledge their lack of experience or lack of access to hardware or software. The second and third person to fill out the questionnaire could see the other answers, and everyone was conscious that others could read their answers. They could copy the answers of their peers, switch them around or be inspired, and this lead to a decrease in the reliability of responses because of an increase in masculine posturing.

Research has shown that boys have a tendency to over-represent and girls to underrepresent their gaming experiences, especially in the presence of others. (Cooper& Stone 1996; Cooper & Weaver 2003, 60-62)

Boys in particular had a tendency to claim access to adult games like *Grand Theft Auto*, *Call of Duty*, *Halo*, *Stick of Truth*, *Infamous*, *Assassin's Creed*, or *Injustice*, and to list them as their *favorite* titles (fully 1/3 of 9-11 year old boys' titles were mature +18 games). However, upon closer inspection, discrepancies between their available hardware and game titles often gave them away. For example, Sam stated that *GTA V*, *Injustice,* and *Saint's Row* were his favorite games when his only game platforms were a Wii and an iPhone.

My hypothesis of hegemonic masculine posturing is reinforced by the fact that the plethora of mature titles from this questionnaire was not seen in the favorite games of subsequent sessions. When subsequent questionnaires were individualized, private responses were less prone to exaggeration. Also in subsequent sessions, male players provided favorite title that were substantially more age-appropriate like *Clash of Clan*, *Minecraft*, *Rayman*, *Mario Bros.*, or *Fifa*.

In this session, girl's favorite games were in line with the gaming hardware they stated owning, and their list of favorite titles once again stood out for its assortment of free casual games like *Fruit Ninja*, *Temple Run*, *Solitaire*, *Subway Surfer* and *Candy Crush*. All 12 girls in this session claimed at least three year's gaming experience. Perhaps this was the only instance of copycat behavior for the girls. However, their other answers remained coherent and individualized apart from this surprising fact.

Three girls from this session stated that they had been playing for over 7 years, i.e., since they were toddlers. They were not in the same groups, and had more interesting game titles like *Just Dance*, *Pokemon*, *Sims 3*, *Minecraft*, and *Mario Bros*. 11 year old Mary had listed the *Sims* and *Minecraft* as her favorite games, but in private discussions, she admitted being fascinated by *GTA V* and playing it at home "all the time." I will come back to explore Mary's case in greater detail as an example of passionate, experienced gamer girls.

Of the 20 boys in this session, only two 9 year olds, from the same group/trio, claimed they had no gaming experience in this session, but both had favorite games that were surprisingly complex for "beginners": *Clash of Clans* and *Total Conquest*. Their titles were appropriate for the shared family hardware available at home, but both games were complex enough to not be considered beginner games. What was interesting was that they described themselves as having no gaming experience because they did not have home video game consoles. Both boys claimed beginner status even though they had access to and used what they considered second-tier gaming hardware: touchscreen devices and handheld consoles associated with casual games. They had incorporated the hardcore gamer versus casual gamer dichotomy (Harvey 2015) and did not feel that their gaming habit provided them with enough gaming capital or tech-saavy when confronted with young hardcore gamers in their workshop.[204]

[204] Harvey, ibid, chpt. 6

Students were also asked about technology in the home, favorite school subjects, other Internet and screen-based activities, and parents' professions. The technology available to them was useful for catching incoherent responses as I discussed previously.

Their favorite school subject was listed as Math (21), French (4), Drawing (3) and History (3), and Sports (1), with even distribution amongst the sexes. Math would continue to come up as a favorite subject in every subsequent session. Considering that at their grade level, only one teacher covers all the principal subjects for a class, and that we had two different schools supplying students from 2-3 grade levels for each session, we cannot attribute this to an exceptional teacher. Students' appreciation of math seemed more in line with the general curriculum and would be an interesting subject to research longitudinally.

While many children responded that they watched videos (frequently about video games), emailed and browsed social media, only one child in that session said he created and posted online content. David, a precocious only-child from a wealthy family with access to a wide variety of game consoles, had skipped a grade in school. David's technological access was parentally lax but was self-imposed to better focus on his academics. David repeated his workshop attendance the following Spring trimester and became emblematic of the smart child that was shunned by peers to better control and limit his influence. All other children said they were forbidden to post anything online, which is in line with parental recommendations concerning children's limited Internet presence.

The question concerning the parents' profession' is one that we only posed in this session. The first reason is that children that age often have a very vague idea of their parent's actual profession. For example, two girls responded with the workplaces where their parents worked (Ubi France & Société Générale; Oracle & GfX), but the girls did not know the type of professions or positions they held. One child told me his mother is a businesswoman with 8 cell phones. A few had no idea what their parents did. Perhaps a few were ashamed of unemployed parents? Not a single child stated unemployed, but with unemployment in France at the time at close to 10%, it would be surprising if every parent was fully employed. Two mothers were listed as homemakers. The ones that knew their parent's profession tended to have parents that were in the extremes of the economic spectrum: in prestigious white collar jobs (CEO, psychiatrist, lawyer, architect, composer, dermatologist), or in the working class and service sector (cleaning lady, bricklayer, cafeteria cook, barman, mechanic, seamstress, hair dresser).

The absence of middle-class and civil servants like municipal employees, teachers, nurses, police, or firefighters is also notable. As I stated in my analysis, the demographic make-up of central Paris has led to a polarization of social classes with wealthy families who can still afford to live in Paris and the poor that benefit from legacy or rent stabilized/public housing. Middle class families abandon central Paris for cheaper arrondissements or for the suburbs. While continuing this question might have proved interesting to link social class to behavior, children's imprecise answers led me to doubt any conclusions that could be drawn from this data without contacting the parents directly.

6.2.8.2 Design Semantic Problems

As for the design semantics of the form, positive answers about engaging in internet-related activities had red checkboxes, negative responses were simple black boxes and were phrased as negative or submissive states: “We do not have one”, or “I am not allowed to do that.” Negative answers were listed squarely below positive ones. (see Fig.6.8)

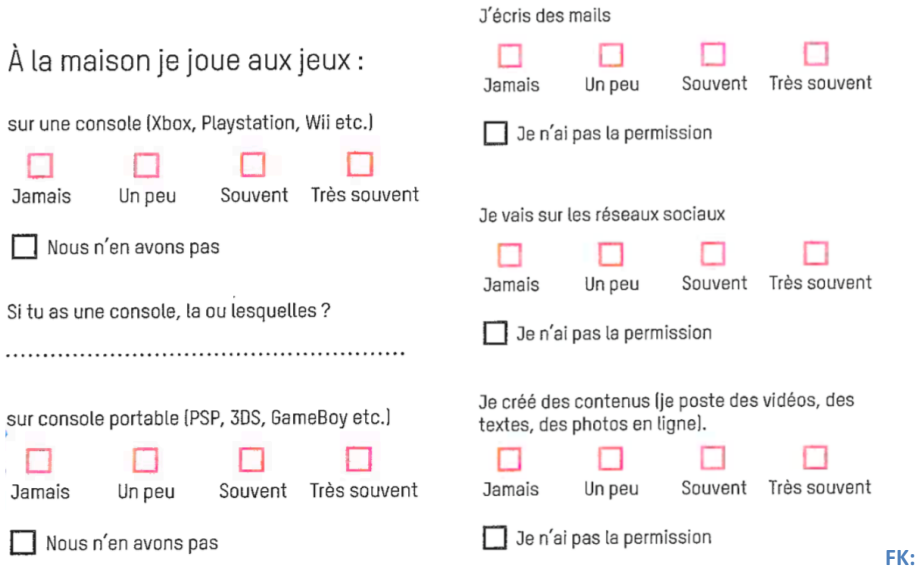


Figure 6.8 Problematic design semantics

In the questionnaire design, the negative answers with black boxes needed to be treated in a graphically identical method to the positive answers above them, to neutralize this risk of untrustworthy or exaggerated answers. The color-coding alone of red and black should have remained the same for all checkboxes. Boys that exaggerated their adult game consumptions in the previous questions may have been tempted to continue the deception in subsequent answers.

6.2.9 Questionnaire Design & Session 2: September-December 2014

My second ARE session was the fall semester of 2014. This was the first ARE workshop of the year for schoolchildren and frequently reflected their first choice of workshops. This was the most masculine group of the year with Tuesday's session composed of 2 girls for 14 boys and Friday's session with 6 girls to 8 boys.

The Fall 2014 questionnaire focused on parental domestic policy and control, number of members in the home, who had access to what technology within the home, video game play in-house and outside the home, and gameplay motivation.

présente-toi !

PRÉNOM .....

Depuis combien de temps joues-tu aux jeux vidéo (en années) :

.....

Tu joues : ☐ à la maison
☐ chez des amis
☐ autre (précise en-dessous) :

.....

À la maison, sur quoi joues-tu ? (ex : PC, PlayStation 4, smartphone, iPad, Ateri 2600...)

.....

.....

.....

Et chez tes amis ?

.....

.....

Dans une journée, combien de temps penses-tu passer sur des jeux ?

☐ une heure ou moins d'une heure
☐ environ deux heures
☐ plus de trois heures

Est-ce que tu joues tous les jours de la semaine, ou seulement certains (lesquels) ?

.....

Qui choisit et achète les jeux auxquels tu joues, chez toi ou chez tes amis ?

☐ toi (tes amis)
☐ tes parents (les parents de tes amis)
☐ les deux à la fois

Je suppose que tu as déjà joué à des jeux déconseillés aux moins de 18 ans (si ce n'est pas le cas, passe cette question) comme GTA, Call of Duty, etc...
Si oui :

☐ tes parents t'en achètent
☐ tu les as achetés toi-même, tout seul
☐ tu y joues chez des amis, ou ailleurs

Indique tes trois jeux préférés, ou les trois jeux auxquels tu joues le plus souvent (si ce sont les mêmes, tant mieux !) :

.....

.....

.....

Pourquoi les aimes-tu autant (plusieurs réponses possibles) ?

☐ tu es fort(e) et tu aimes tout réussir dans ces jeux
☐ tu dois essayer plusieurs fois pour réussir et tu aimes t'améliorer à chaque fois
☐ tu aimes passer du temps à y jouer et cela te divertit, comme n'importe quel autre activité

Autre : .....

.....

présente-toi !

Quand nous étions petits (ce n'était pas il y a très très très longtemps, merci), il n'y avait pas de smartphones, tablettes, consoles, pas non plus de jeux sur ordinateur (en tout cas pas des très passionnants).
À notre place, comment auriez-vous occupé le temps que vous passez aujourd'hui à jouer à des jeux vidéo ou sur internet ?

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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.....

.....

Figure 6.9 Individualized questionnaire from my second ARE Workshop, Fall 2014, Sept.-Dec. 2014. (See appendix for large-scale version)

Fall 2014 individualized questionnaire requested on the front of the form:

- First name
- How long have you been playing video games (in years)
- You play: At home, at a friend's house, other (specify where)
- In a day, how long do you think you spend playing games?
    - One hour or less than an hour
    - About two hours
    - Three or more hours
- Do you play every day of the week, only on weekends or only on certain days? (which ones?)
- At home, what do you play on? (PC, Playstation, smartphone, iPad, Atari 2600…)
- And at your friend's house?
- Who choses and buys the games you play (at your house or your friend's): You (or your friend), your parents (or your friend's parents), both
- I suppose you have already played at games that are not recommended for under 18 (If this is not the case, skip this question) like *GTA*, *Call of Duty*, etc. If yes:
    - Your parents buy them for you
    - You buy them yourself, by yourself
    - You play at a friend's house or elsewhere
- Indicate the three games you prefer or play the most (if they are the same, even better):
- Why do you like them so much (multiple answers possible) :
    - You are strong and like succeeding in these games

- You have to try several times to succeed and you like getting better each time.
- You like spending the time playing and it entertains you, like any other activity
- Other

Questions on the back of the form:

- When we were little (it wasn't that long ago, thank you), there weren't smartphones, tablets, consoles, computer games (in any case not that exciting). In our shoes, how would you have occupied the time that you currently spend playing video games or on the internet?

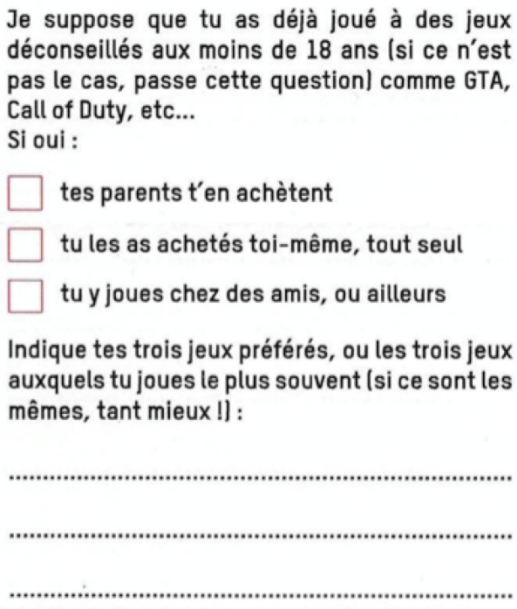
Theo and I had discussed the problems of the first forms so we decided on individual questionnaires. As I stated previously, the subsequent individualized questionnaires lead to much less hegemonic masculine posturing, thanks to an increase in children's privacy.

There is one question in the second questionnaire that poses a problem. I had mentioned to Theo and Oscar that the prevalence of mature game titles in boys' favorite games was a bit surprising considering their age. (Our "negligent" parenting skills put the same types of mature games in the hands of our children at home, but we assumed we were in the minority for this type of lax behavior. Either careless

parents are pervasive, or some boys exaggerate their access to mature titles) The 8th and 9th question that once again, assumes that children have access to mature video games:

“I suppose you have already played games not recommended for less than 18 year olds (if this isn’t the case, ignore this question) like GTA, Call of Duty, etc. “

“What are your 3 favorite games, or what are the three games you play the most frequently. (If they are the same, good for you!)”


Je suppose que tu as déjà joué à des jeux déconseillés aux moins de 18 ans (si ce n'est pas le cas, passe cette question) comme GTA, Call of Duty, etc...
Si oui :

- ☐ tes parents t'en achètent
- ☐ tu les as achetés toi-même, tout seul
- ☐ tu y joues chez des amis, ou ailleurs

Indique tes trois jeux préférés, ou les trois jeux auxquels tu joues le plus souvent (si ce sont les mêmes, tant mieux !) :

.....

.....

.....

Figure 6.10 Problematic questions for questionnaire 2

Once again, assuming kids have access to mature games will make hegemonic masculinity salient in their answers. But children who have no adults playing at home or negotiate game purchases with their parents rarely have carte blanche for adult titles. Like cigarettes or alcohol, children are not supposed to be able to buy adult games by themselves.

By simply posing a conspiratorial question that they might have access to mature title increases the likelihood of getting mature titles in their list of favorite games and increase the likelihood of masculine posturing.

Of the 30 students in that Fall 2014 session, 11 say that they do not have access to mature titles, 7 say they have access through a friend's house, 4 via their parents, 1 from parents and friends and 1 from "all three ". This means that only one student out of 30 acknowledged that they *might* purchase mature titles by themselves. This is a different scenario from the last session with rampant mentioning of their favorite mature titles. Suddenly, only one child out of thirty claims a parent allows them to purchase adult titles by themselves.

My partner and I analyze games for professional benchmarking, so we play all games, even mature ones, as a family. We are an admittedly atypical household, but my partner and/or I purchase every console and computer game in our home. Our children may have access to these games but we informed our son that we receive email reports if he enters the adult sections of certain games such as the "strip clubs" in *GTA V*.

My 11-year-old gamer son, who has played *God of War*, *GTA*, *Assassin's Creed*, *Saint's Row*, *Call of Duty* and a profusion of mature games with us, lists his three favorite titles as: *Counter Strike* (PC), *Sly Cooper* (PS 3) and *Terrarria* (PC/steam). My son gets STEAM Credits for his birthday. My 17 year-old daughter lists *Legend of Zelda: Ocarina of Time* (GameCube), *Sims 3* (PC) and the *Uncharted* series (PS3/4) as her three favorite titles of all time. In other words, in a world of relatively limitless

possibilities, their favorite game titles are closely linked to intense, contextual, personal experience, rather than age-related transgression.

Because this session had fewer kids and lasted 16 weeks, I was able to compile additional questions over the Fall session; for example, how did their parents limit their gameplay? The few girls in this session had no parental time limits but were often limited to playing on weekends. Girls' game selection continued to be insipid and financially limited, with a lot of free games on shared touchscreen devices. Their lack of parental time limits was not surprising because quite a few free games on their list, like *Candy Crush*, have automatic half hour waiting periods after five lost lives. Free, casual games with short levels use this waiting period mechanism to incite players to purchase « lives » to play without interruption. Children are not allowed to make these purchases with adult approval,[205] rendering free games' waiting periods a de facto time limit on gameplay.

The favorite games listed by boys tended towards purchased games for home or hand-held consoles, and they reported having heavily negotiated play sessions controlled by their parents. Purchased games often have longer, more complex narratives and gameplay, and do not have built-in waiting periods. This type of game allows the player to become more fully immersed for long sessions, requiring parental intervention when gameplay sessions pass into a hypothetical "problem" category, anywhere from one to three or more hours depending on the parent's

[205] A former colleague of mine now at King, *Candy Crush's* publisher, told me that people really do purchase additional lives when I inquired into the viability of that business model.

tolerance level. Below is a chart of the children's self-declarations for the Fall 2014 session.

Sex	play@ home	play@ friends	Home equipment	Time spent per day	What days	Who buys/ choses games	Favorite game 1
F	x	x	iPad and smartphone	1<	only weekends	me	**Mario**
F	x		Pc	1<	weekends	both	*Monopoly*
F	x	x	iPad, Wii, PC	1<	weekends	me	**Kirby**
F	x		iPad, Wii, iPhone, ds	1<	weekends and Friday	me	*Movie Star Planete*
F	x		iPad	1<	weekends and wed	both	*La bonne Paie*
F	x	x	pc	2	everyday	me	*Movie Star Planete*
F	x	x	DS, 3dsXL, Wii, iPad	2	everyday	me	**Animal Crossing**
F	x	x	Smartphone	2	everyday	me	*Temple Run*
M	x	x	Pc, ps3, psp, Wii	1<	certain days	both	**One Piece**
M	x		Pc	1<	certain days	parents	**Dragonball Z**
M	x		Wii	1<	everyday	me	**Mario**
M	x		iPad	1<	everyday	parents	**Fifa 14**
M	x		PC, PS3	1<	everyday	parents	*Boxed bounty hunter*
M	x		smartphone	1<	only certain days	both	**Minecraft**
M	x	x	Ps3	1<	weekends	both	**Portal**
M	x		Wii	1<	weekends	me	**Fifa 14**
M	x	x	Pc, ps 4, xbox1, iPhone, iPad	2	everyday	both	**Need for Speed**
M	x	x	iPad	2	everyday	both	*Bulu*
M	x	x	Wii, 3ds	2	weekends	both	**Minecraft**
M	x	x	Wii, 3dsxl, pc	2.5	2 weekdays 3 weekends	me	**Kirby**
M	x		Tablet	3+	everyday	both	**Super Sky**
M	x		iPad, iPhone, ps3, Wii u	3+	everyday	me	**Mario Cart 8**
M	x	x	3dsX4,wii	3+	everyday	both	**Monster heteur** (Hunter)
M	x	x	PS4, ps3, Wii, dsi, dsxl, xbox1	3+	everyday	both	**Little big planet**
M	x	x	Wii, ps3, tablet	3+	everyday	me	**Assassin's creed**
M	x		Xbox 360	3+	everyday	me	**Watchdogs**
M	x	x	pc, ps3, xbox360	3+	weekends	both	**Minecraft**
M	x	x	Ps4	3+	everyday	me	**Avengers**
M		x	Xbox but never play	1<	only at friends	friend	*None (moto)*

Figure 6.11 Fall 2014 session video games and domestic policy of the: 8 girls and 22 boys.

5 out of 8 girls play an hour or less on weekends, and 3 out of 8 girls play approximately two hours every day. Not a single girl claims to play over three hours a day, but, as we stated before, girls have a tendency to under-report their time spent

playing video games since it is not seen as valorizing for them. (Cooper & Weaver 2003) Of the three frequent girl gamers, one has access to a PC (*Movie Star Planet* is her favorite game), one has access to two hand-held consoles, an iPad and a Wii (*Animal Crossing* and *Nintendogs* are her favorite titles), and the last girl says she only has access to a smartphone (*Temple Run* is her favorite game).

Playing two hours a day, every day, with the hardware and games the three girls declared suggests amazing resolve and would be an impressive feat. Hopefully, thanks to this workshop, the girls will demand more challenging and stimulating video games (and hardware) when they grow older.

Only 1 out of 4 girls (25%) said that her parents recommended or bought games for her. Three out of four girls said they requested and bought the games themselves, however, only three of the eight girls listed moderately priced game title as their favorite game. Two girls said they were self-instigators for their purchased Nintendo game selection, Ella and Haley, who will be discussed in the next section. The five other girls selected the free to play games that were unlikely to meet any parental objection. I doubt girl's parents are more negligent than boy's parents, but the gendered discrepancy in parental involvement concerning video game selection and purchasing was very disheartening.

For the boys, 9 out of 22 say they play an hour or less a day, and out of this group, 1/3 play everyday. 4 boys out for 22 say that they play around two hours a day; 3 of them play every day. Finally, 8 out of 22 say they play three or more hours a day; 7 of those boys play everyday.

What really discerns the boys from the girls in Figure 6.11 is the variety of their favorite games. Boys from every segment of differing domestic policy had access to a greater variety of game genres and listed a majority of purchased game titles. Parents were involved in 13 out of 22 of the purchases and recommendations for boys's games (59%), showing much greater parental involvement and concern in guiding boy's initiation into the world of technology through some admittedly wonderful games. What was even more tragic for this session was that many titles that appeared in boy's favorite games were excellent games for children of any sex like *Minecraft*, *Portal*, *Little Big Planet, Mario Cart* and *Bulu*.

One can only hope the girls' parents compensate their technological inattention in other domains because their involvement and concern in introducing girls to the marvels of digital technology was essentially MIA (missing in action) for this session. If stereotype threat and Impostor phenomenon weren't enough of a handicap, these girls' lack of parental guidance and advocacy could be considered another social hurdle to overcome.

6.2.9.1 The Fall 2014 Tuesday session with 2 girls and 14 boys

I must mention that the Fall 2014 Tuesday session, had only two girls who selected the Learning to Play workshop as their first ARE choice. I was a little dismayed at this overwhelmingly male group, wondering what I was going to be able to observe. Two girls, Haley and Ella, who were holding hands off to the side in the corner, wearing matching silver glitter headbands and stylish dresses. As we toured the center, I asked the girls (who seemed a little nervous) if they would like to be in a group together, and if so, which classmate would they like to have join their group. I

empathized with them, being an only girl in Math club and programming classes. The girls asked to be together and chose Jared without hesitation.

Jared had long-hair, a friendly open personality and five year's gaming experience. The two girls were also keen gamers themselves, with 4 years of experience each. The girls preferred Nintendo games like *Sonic, Kirby,* and *Mario*, while Jared was a *Minecraft*, *Battlefield* and *Assassin's Creed* fan. All 3 reported that at home they were only allowed to play on weekends.

While this was the only mixed-sex group in that section for that trimester, they were fascinating to observe. Jared and Haley both assumed androgynous gaming performance: invested in the game, patient, helpful and pleasant. Ella however assumed a more feminine gender performance, being more into interacting with Jared than with the game. She played less than her groupmates and with less conviction; she was quicker to turn over her gamepad in the face of conflict. She controlled the clipboard and questionnaires more than her groupmates. Had she been assigned to a group with a boy she was indifferent to, I wondered, would she have behaved more like Haley?

The other groups of male-only players also provided some interesting opportunities for observation since a few declared themselves relative beginners and assumed more submissive roles within their all male groups. They were also less likely to grab the gamepad to start the group's play session and were quicker to give them up in mid-session in the face of insurmountable gameplay obstacles. We rarely had to tell beginners to share the gameplay with teammates, whereas experienced, passionate gamers often had to be reminded to share once they were playing. Beginner boys

assumed the role associated with female gamers. Experience was the differentiating factor in these all male groups.

6.2.10 Questionnaire Design & Session 3: January 2015-June 2015

Due to a citywide state of emergency sparked by the terrorist attacks in January 2015, my last group was a hybrid of the second and third ARE trimester of the school year. Schoolchildren chose this workshop as a second or third place choice, and the heavily male sample of the fall semester gave way to a better male/female player ratio (Fig. 6.7).

Technically, the questionnaire was given to two sessions, Winter and Spring 2015, but the high redundancy of participants who chose to stay and repeat the workshop reduced the actual research subject count. Taking this factor into to consideration resulted in 32 unique boys and 19 unique girls who responded to this third questionnaire.

présente-toi !

PRÉNOM

Depuis combien de temps joues-tu aux jeux vidéo (en années) :

Possèdes-tu des plateformes de jeu, qui sont les tiennes uniquement?
(ex : PC, PlayStation 4, smartphone, IPad...)

As-tu des frères et soeurs ? Précise-nous s'ils sont plus ou moins âgés que toi en écrivant + ou - à côté de tes réponses.
(ex : Soeur + / Frère -)

Possèdent-ils leurs propres plateformes ? Lesquelles ? Et tes parents ?
(ex : Soeur : PS4 / Papa : IPad)

Est-ce que tes parents jouent à des jeux vidéo avec toi ?

Est-ce qu'ils jouent aussi seuls ?

Qui choisit et achète les jeux auxquels tu joues, chez toi ?

- [ ] toi
- [ ] tes parents
- [ ] les deux à la fois

Indique tes trois jeux préférés et sur quoi tu y joues, ou les trois jeux auxquels tu joues le plus souvent (si ce sont les mêmes, tant mieux !) :

(Tu peux barrer le mot qui ne te concerne pas dans la question suivante)
Penses-tu que les jeux auxquels tu joues sont des jeux pour filles - garçons ?

- [ ] oui, c'est sûr
- [ ] oui, mais ça plaît aussi aux filles - garçons
- [ ] non, c'est pour tout le monde
- [ ] non, je pense que c'est pour les filles (si tu es un garçon)
- [ ] je pense que c'est pour les garçons (si tu es une fille)
- [ ] je pense que Frédérique devrait mener ses propres recherches si elle n'aime pas les questionnaires existants, même si les questions qu'elle aimerait traiter sont très intéressantes mais c'est pas vraiment le problème, c'est juste le principe non mais oh

présente-toi !

Quand nous étions petits (ce n'était pas il y a très très très longtemps, merci), il n'y avait pas de smartphones, tablettes, consoles, pas non plus de jeux sur ordinateur (en tout cas pas des très passionnants).
À notre place, comment auriez-vous occupé le temps que vous passez aujourd'hui à jouer à des jeux vidéo ou sur internet ?

Figure 6.12 Questionnaire for the Winter and Spring ARE sessions, Jan.-June 2015.

Third questionnaire, questions requested on the front of the form:

- First name
- How long have you been playing (in years)?
- Do you have a gaming platform that is only yours?
- Do you have brothers and sisters? Tell us if they are older or younger than you by writing a + or – next to your response. (ex. Sister +/ Brother -)
- Do they have their own game platforms? Which ones? And your Parents? (ex: Sister: PS4/ Dad: iPad)
- Do your parents play video games with you?
- Do they also play alone?

- Who choses and buys the games you play at your house : You, your parents, both
- Indicate the three games you prefer or play the most (if they are the same, even better):
- (You can cross out the word that does not concern you in the following question) Do you think that the games you play are games for girls – boys?
    - Yes of course
    - Yes but it also appeals to girls-boys
    - No, it's for everyone
    - No, I think it's for girls (if you are a boy)
    - I think it's for boys (if you are a girl)
    - I think Frederique should do her own research if she doesn't like the existing questionnaires, even if the questions that she would like to pose are really interesting… *(Note: this was an inside joke, but Theo took my criticism of the questionnaires quite personally.*)

The back of the form included the same alternative pastime question as the second questionnaire: When we were little (it wasn't that long ago, thank you), there weren't smartphones, tablets, consoles, computer games (in any case not that exciting). In our shoes, how would you have occupied the time that you currently spend playing video games or on the internet?group

The questionnaire's focus shifted to technology use in the family, age of siblings, shared access or private equipment, whether parents played video games with the children and/or played without them, and their attitude towards the gender of their

favorite games. This questionnaire caused fewer semantic problems, aside from a sensitive working relationship with Theo.

The first item that jumped out at me from this data was that 6 girls out 19 girls (32%) said their parents played video games but not with them. Only 4 out of 32 boys (12.5%) also said their parents played but not with them. Perhaps this was due to the girl's preeminence of casual games and handheld devices that didn't lend themselves as readily to group play? I was sad for the girl's and their parent's missed bonding opportunity.

In the last session, I continued asking about parental time limits and content control at home during informal discussions with the most avid gamers. Not a single girl I spoke to had time constraints, though some had "unsafe" content filters to limit the sites they could access. Harvey (2015) explains that while filtering technology may be installed by fathers, her research showed mothers principally controlled time limits on their children's gameplay as performance of good parenting — of assuring them and their community that they are bringing up well-balanced kids that will grow up to become productive members of the neoliberal society.[206] Not a single girl I spoke to had parental time constraints on video game play because they stopped playing on their own when they grew bored. It's hard to get so absorbed by casual games where flow (Csikszentmihalyi 1990, 1997) is achieved and notions of time cease to matter.[207]

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[206] ibid. Chapter 5.

[207] Csikszentmihalyi, M. (1990) Flow: The Psychology of Optimal Experience. Harper & Row Publishers Inc., 1990. Csikszentmihalyi, M. (1997) Finding Flow. Basic Books/Perseus Books LLC., 1997.

The other big takeaway from the total set of questionnaires collected was that children with older brothers and sisters generally had more technology available to them at home, whether shared or not, and had significantly more years of gameplay experience. First-born children (17 out of 52) and only children (3 out of 52) children usually had the least equipment (often smartphones and handheld devices) and had to do the heavy lifting to convince reluctant parents that this was a good investment for their family. Children with the good fortune of having older brothers and sisters were able to take the path to technological access that had been paved by their older siblings and were therefore able to start playing video games earlier than first-born children.

An outlier to this "fortunate younger sibling" theory was a precocious boy, David, an only child and avid game player that had skipped a year of elementary school. This was his second *Learning to Play* workshop attendance. David had a slight build, but the age difference with the other kids in his grade made him appear even smaller. David owned pretty much every game console released in his lifetime thanks to his father's prolific gaming habits. David told me he used to spend a tremendous amount of time playing but had recently stopped to focus on his academics since he had to cover a year's worth of math to be up to par with the class a year ahead of him. He was quick to tell others what to do in a game, and his groupmates generally responded to his pushiness by ignoring him completely. Ostracism is a mechanism that Brenda Laurel (1998, 2001) identified as a feminine form of social control in her

gender research at Interval Research Corporation.[208] Mixed-sex groupmates engaged in this silent treatment against David to put him in his place when he became a too aggressive.

The "fortunate younger sibling" theory also allowed me to come across my second female edge case, Sara, who was a very experienced, passionate player and who also had access to mature titles. Sara is the fourth youngest child of a large family with an older sibling in his 20s still living at home. Interestingly, Sara shares some similarities with another edge case, Mary, the details of which will be discussed in section Reception: Edge Case Studies.

David and Kevin were the two most experienced male players of their group. While David, an only child, acquired his experience thanks to his father, Kevin was the youngest of four siblings. Both said that they began playing at 1 year old. Kevin played 3 hours on weekdays and 5 hours on weekends with parental time controls. In the workshop, Kevin displayed difficulty in sharing the gameplay with his groupmates and presented the signs of the "problem gamer": he was socially awkward, had acquired gaming capital through significant time and effort, and had an intense focus on gameplay to the detriment of social interaction once he began.

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[208] Laurel, B. (1998) An Interview with Brenda Laurel. (Purple Moon) In Cassell J. & Jenkins H. (Eds.) *From Barbie to Mortal Kombat: Gender and Computer Games* (P. 118-135). MIT Press.
Laurel, B. (2001). *Utopian Entrepreneur*. MIT Press, 2001.

6.3 Research Findings

6.3.1 Meta-Analysis of Questionnaires

I aggregated the only standardized data from the various sessions that could be compared, i.e., their favorite games. The take-away regarding hardware is that children have a wide array of screen based-devices that compete for their time. Boys have access to more "hardcore" home console technology like the PS3 and Xbox 360 (which they may be the sole users of, and not have to share with other family members) than the girls who cited the Wii and WiiU most frequently as the family's home console. An equal number of boys and girls have handheld consoles, and these are usually considered private technology. PCs, home consoles, iPads and smartphones are generally the property of parents or for the whole family. Children in households with older siblings tended to have longer lists of shared technology and were given earlier access to that technology, i.e., the "fortunate younger sibling." At the age of 9-11, this birth-order advantage is pretty noticeable because children in non-video-game-playing households start to request PCs and video game consoles from parents around this age while those with older siblings often have access to home consoles or PCs without needing to negotiate their purchase.

Because hardware questions were posed differently for each session, comparing the data was difficult due to the different contexts, children's self-declaration and possible omissions. "Favorite games" was the only standardized question from the various sessions that could be compared. I compiled the favorite games by sex from all the children into a chart (Fig. 6.13), girls on the left and boys on the right. If we

look at their favorite games, girls had a harder time coming up with three favorite titles. Children of both sexes were sometimes creative with spelling, indicating that either they had trouble spelling, they didn't see the packaging or titles, or they didn't have the game.

The most obvious divergence of these two groups is the absence of expensive "AAA" recent releases from girls' list of favorite games. Not a single girl listed *Portal, Mirror's Edge, Rockband* or *Little Big Planet*. Girl's high-end titles are in the mid-priced Nintendo family games like Mario or Kirby. *Just Dance* is just for girls. *Minecraft* is very affordable and popular with both sexes. The frequent presence of free to play games in girl's list of favorite titles is most telling. This poverty of game options for girls cannot be ascribed to social class.

For the boys, the most frequent free to play game is *Clash of Clan,* which has in-app purchases. *FIFA*, *Grand Theft Auto*, and *Minecraft* are their most common game choices, but the diversity of other paid titles also garner attention. *Zoo Tycoon*, *Pokemon*, *Portal*, *Lego Star Wars, Little Big Planet,* or *Rayman* could just as easily be given to girls.

As we saw in the Fall 2014 group, parents are more involved in the game selection and purchases of video games for boys (59%) than for girls (25%). If a girl stated that her parents were also involved in the selection and purchase of games - but she only listed free to play games as her favorite titles – it is safe to assume that her parents are not involved in a critical selection process. If girls' parents are unmotivated and disinterested, girls will need to exert much more effort to find worthwhile games and negotiate their purchase. It is worth repeating, girl gamers rarely have access to a

network of same-sex peers for word-of-mouth recommendations which presents girls with a significant obstacle to the exposure and practice of other more challenging/gratifying games.

The few girls that had a passion for games had access to a much wider array of games, many of them "boy games," like *FIFA* and *GTA*. They were in households with older siblings and parents that played games and provided the girls with easy and relatively unrestrained access. Girls' gaming passion was a by-product of technological access, not a deliberate parental strategy that was cultivated through informed, critical purchasing decisions for their daughters.

Many girls only had access to touch screen devices to play on, often the parent's devices, and provided with gendered girl games like *Movie Star Planet* that reinforce gender stereotypes rather than encourage a passion for technology. This finding is independent of social class. Boys across the social spectrum have access to a greater variety of titles and technology – i.e., they are provided with an allowance for technological consumption — that girls are not provided. This disparity illustrates a mindset of parents who are not interested in encouraging their girls to embrace technology.

Girl game 1	Girl game 2	Girl game 3
Animal Crossing	**Nintendogs**	
Animal Crossing	**Pokemon**	*Subway Surf*
Animal Crossing		
candy crush	*chess*	*dame*
Candy Crush Saga	*Candy Crush Soda*	*Rescue Saga*
Clash of Clans		
fifa 15	**Just Dance**	**Minecraft/GTA**
geometry dash	*Zombie Tsunami*	
InSync	**Puppeteer**	**Platypus**
Just Dance	**MineCraft**	
Just Dance 4	**Mario**	
kirby	**mario**	**sonic**
La bonne Paie		
League of Legends	**Minecraft**	**Just Dance**
Mario	**Kurbi**	
Mario		
Mario	*Candy Crush*	
Mario		
Minecraft	*Clash of Clans*	**Tomodachi Life**
Minecraft		
Minecraft		
Minecraft		
MoneCrophet/Minecraft		
Movie Star Planet	**Mario Bros**	
Movie Star Planet	*Subway Surfer*	*Geometry Dash*
Movie Star Planet		
Movie Star Planet		
None		
None		
Pokemon	**Mario Bros**	
Rayman		
Sims3	**La Nouvelle Maison**	
solitaire	**Mario Kart**	
Subway Surf	*Temple Run*	*Jeux de manucure*
Temple Run	*Fruit Ninja*	
Temple Run	**Wii Party**	*CandyCrush*
Temple Run	*Zombie Tsoonamie*	**Mario Kart/King Kong**
Temple Run		
Tomadachi Life	**Mario**	**Art Academy**

Boy game 1	Boy game 2	Boy game 3
Assasin's creed	**Minecraft**	**Ratchet and Klonk**
Avengers		
Battlefield 3	**Modern Warfare3**	**Fifa 15**
boxed bounty hunter	**Call of Duty**	**Osu**
bulu monstre		
Clash of Clan	*Boom Beach*	
Clash of Clans	*Colosotron?*	*Total Conquest*
Clash of Clans	**GTA5**	**Call of Duty**
Clash of Clans	**Mario 3D World**	
Clash of Clans	**Mine Craft**	*Candy Crush*
clash of clans	**minecraft**	**Lego Star Wars**
clash of clans	*total conquest*	*colossatron*
Clash of Clans		
Clash of Clans		
Clash of Clans	*Gangster Vegas*	
Farming Simulator		
fifa	*clash of clans*	**Rayman Legends**
FiFa	**Last of Us**	**GTAV**
Fifa 13-15		
Fifa 14		
Fifa 14		
Fifa 15	**Minecraft**	**"getea"**
fifa 15	*Shark dash*	**Spiderman**
Formula 1	**Fifa13**	**Spiderman**
Frieve (250 free games)		
Garry's Mad	*Super Hexagon*	*vvvvvvv*
Geographiecon	*Clash of Clans*	*Stormraiders*
Gnak	*WWE2012*	
GTA V		
GTA4	**Call of Duty**	*Clash of Clans*
GTA5	**Halo**	**MineCraft**
GTA5	**Saint's Row**	**Assasin's Creed**
Head Soccer	*Temple Run*	*Asphalt 8*
Infamous	**Waetocs?**	**Assasin's Creed**
Injustice	**Amazing Spiderman**	**X-Men Origins**
Injustice	**Clash of Clan**	*Vector*
Katch 2013	**GTA V**	
Kirby	**Pokenmon X**	**Pokemon Y**
Little big planet	**GTA**	
mario		
mario Bros	**Asterix**	**Mario Kart**
Mario Cart 8		
minecraft	**battlefield**	**Assasin's Creed**
Minecraft	*Clash of Clans*	**Stick of Truth**
Minecraft	**CrossFirE**	*Clash of Clans*
MineCraft	**GTA5**	**Halo**
MineCraft	**Injustice**	
minecraft	**skylander**	**spiderman**
MineCraft		
Minecraft		
Minecraft		
Monster hunter 3	**Injustice**	**Okami**
MSP	**Mario**	**Tekken Academy**
Need for Speed	**GTA5**	**Watchdogs**
Need for Speed	**Uncharted3**	**BatmanArkhamOrigine**
none		
none		
One Piece	**Dragonball Z**	
One Piece	**DragonballZ**	**Need for Speed**
Pokemon Saphir	**Pokemon Alpha**	**Pokemon Rubis Omega**
Portal	**Mario**	**Lucky Luke**
resident evil 4	**Saint's Row IV**	**Hyrule Wariors**
Star Wars MMX		
Super Sky		
super smash Bros	**Minecraft**	**Mario Cart 8**
super smash bros (wiiu)	**Fifa 15 ipad**	
Total Conquest	*Minion Rush*	*Fruit Ninja*
Watchdogs	**Injustice**	
Zoo Tycoon	**Kinect Start Wars**	**Kinect Joyride**
Zoo Tycoon	**Minecraft**	**Dontou spyk**

Figure 6.13 Three favorite games listed by sex for all ARE sessions, girls on the left and boys on the right. Bold: paid titles. Italics: free to play (with in-app purchases)

When I asked about their gameplay at home, the girls who were more interested than others in gaming told me they quickly grew bored of their games and moved to other activities without being prompted by parents. Free to play games that have built-in time limits to encourage the purchase of uninterrupted gameplay or additional "lives," and children cannot purchase them with parental approval. This limits gameplay automatically.

Girls did not have parental time limits set because their gameplay was not seen as problematic by the parents. Rather than examining the mediocre quality of games provided to girls that stop playing them without being prompted, parents may choose to simply believe that girls are "not that into technology," and that they do not need to encourage this any further. Many parents cringe at the thought of raising stereotypical socially-awkward gamer girls and may be relieved to find their daughters bored by these insipid games they had access to or knew about.

In the end, these girls had access to less technology compared to their male classmates, to a narrower variety of games, and were introduced to technology later in childhood. Parisian parents, even parents that play video games themselves, do not actively encourage girls' digital gameplay because they do not see this as a necessary or beneficial activity for them. The gender-divide in ICT and lack of women in STEM has not trickled down to the consciousness of these parents. Even the girls whose parents worked at tech companies in the Spring 14 session appeared to isolate them from screen-based digital media.

While the connection between digital consumerism and the desire to go into an ICT or STEM career is far from clear or direct, keeping children quarantined from

technology pretty much assures their delay in the acquisition of tech-savvy skills. Further, it will be difficult and intimidating to overcome their gap in knowledge, reducing chances of choosing an ICT or STEM career down the line.

If the technology is provided in the form of girl games like *Movie Star Planet* or *Nintendogs*, the gameplay is often reinforcing other gender norms such as cultivating one's appearance or care-taking (dogs, animals, babies, etc.). These games rarely have the breadth, length of gameplay and intellectual complexity of games for the general public or masculine AAA titles. Girl games reinforce the idea that technology needs to be dressed up in gender stereotypes to be accessible or interesting to girls, when the mediocrity of the product is precisely what will limit the girl's engagement with technology. We want girls to become fascinated by technology, not become appearance-obsessed or think their purpose is only through the care of others. Similarly, learning to care for others should concern all children, not just girls.

Like a self-fulfilling prophecy, the limited opportunities, challenging technological access and mediocre games reinforce the idea that "girls are just not that into video games."

6.3.2 Reception: Edge Case Studies

6.3.2.1 Sara and Mary: Passionate, Experienced Gamer Girls

Sara and Mary form one type of edge case with striking similarities worth exploring in more detail. They have been playing for at least 6 -7 years each and play mature titles regularly at home with their older siblings and alone.

They both grew up in large families with significantly older siblings. Mary has two older siblings in their 20s living at home, a brother and sister. Sara has a brother in his early 20s as well as a slightly older brother and sister and a slightly younger brother who she is very close to. Mary and her four older siblings each have their own bedrooms, a rare situation for large Parisian families. Sara on the other hand lives in social housing, and the family shares a crowded three-bedroom apartment.

Both girls come from dual-income large families where video games have been a part of their media landscape since their infancy. Their older siblings have school and work that keeps them out of the house in the afternoon, so the girls have relatively easy access to the video game console in the living room, along with a significant library of game titles purchased for their older siblings.

Both girls had low popularity status in their class. Mary sought adult interaction in the workshop. She frequently came over to talk to me about her love of *GTA V* and seemed pleased to have a non-judgmental adult to discuss her gameplay passions with. *GTA* is not beloved by feminists because of its shallow, predictable, misogynistic use of female characters and sex workers. However, Trevor Philips, *GTA*'s psychotic and morally bankrupt playable character, is one of my favorite video game criminals of all times because you develop sympathy for him over time. Mary loves to explore the open world of *GTA*'s fictional Los Santos with bikes, boats, cars, helicopters, and gliders to take pictures rather than follow its heist-based storyline. *GTA V* 's open

world is visually stunning and realistic, and professional photographers have been creating a body of work out of GTA's street photography feature.[209]

GTA earns its +18 adult rating: rape scene, strip clubs, prostitutes that you can kill to get your money back, and of course, graphic violence. Every time Trevor appears in a cut scene of the storyline, we stopped the game to make our son leave the room. Mary's parents knew her brothers played this game with her, but not that she played by herself. She said her parents let her play as much as she likes "a lot of games meant for my age group." Mary's parents gave her room to exercise self-regulation and auto-censure. Parents frequently assume that GTA's disturbing experiences are children's only motivation, but Mary knew she could explore *GTA* open world and ignore the disturbing parts of the game. Paradoxically, she was more likely to encounter its disturbing scenes if her brothers played the story line with her in the room, so she preferred playing *GTA* alone to explore Los Santos as a virtual tourist. She talked with great excitement about what she saw on her long virtual bike rides and when hand-gliding off the hills, a freedom rarely given to 11 year old girls. She was playing the game exactly as she wanted and exercised control and personal responsibility. She did not tell her parents she played GTA in virtual tourist mode because she did not want to risk provoking the moral panic associated with the game. So she stated on the form that she followed the domestic policy of playing age-appropriate games, but in practice, she exercised nuanced judgment of what was and was not appropriate for her.

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[209] One example, Fernando Villela : https://www.fernandovillela.com/procedural-generation/

While Mary was simply unpopular, Sara was an outcast in her class. She would occasionally be accompanied by a social worker, generally reserved for students with learning and/or behavioral problems. Sara played video games with ease and passion, but she would throw tantrums and had problems sharing the gameplay with her groupmates. She had poor conflict resolution skills and frequently got sent to the *pouf des lourdos* for some time-out. I would wait for her to calm down before coming over and talking to her. Unlike Mary who craved adult interaction, Sara was much more suspicious of adults and harder to talk to. I told her that I had seen her at the center play with her younger brother and that she played very skillfully. It took quite a bit of effort over time to overcome her antipathy towards me.

Like Mary, Sara had unsupervised access to a console and games originally purchased for and by her older brothers and sister. They barely played any longer, so Sara frequently played with her brother who was only a year younger than her. She told me that since she was the oldest she generally chose the games they played, and they included mature titles like *GTA* and *Assassin's Creed*. She was particularly fond of *FiFA* and combat games for its multi-player capabilities. Sara was not as forthcoming in her talk about video game play, but she definitely had built up some significant gaming capital.

Sara and Mary were too young to identify themselves as gamer girls; they were normal pre-adolescent girls. Mary dressed like the other girls her age and interacted mostly with other girls. Sara might qualify for "tomboy" status. Sara came from a difficult social context and had an aggressive interpersonal style that we might associate with masculinity. However, her aggressiveness was probably more for self-

protection. She played mostly with her younger brother and his friends probably due to her low popularity and classmates' general avoidance of her.

While video games were not the ideal path towards peer-acceptance or popularity, Mary and Sara were able to develop considerable gaming experience, skills and passion, through relatively easy access to a game console and a wide variety of complex games. They enjoyed moments of unsupervised access, which in turn allowed them to exercise self-control and personal responsibility. This freedom allowed them to explore games that might be considered unsuitable for their age group, but through the game's rich complex narratives and extensive gameplay, the girls developed passion and gaming capital that would not be possible if they only had access to short casual games or girl games.

6.3.2.2 Evan: The Dispassionate Non-Player

In fall session of 2014 when most children were enjoying their first choice ARE activity, Evan nearly slipped below my radar. My attention was still focused on girls' gender performance in the ARE sessions. On his form, Evan stated that he had one year's gameplay experience, but he was the *only* child who participated in the ARE workshop who said he *never* played video games at home but only at his friend's house. Even though he had access to an Xbox at home and played with his friend, he could not name a single game title he played at his friend's house.

On his form, he had crossed out his answer saying that his brother has an Xbox but that he doesn't play at home. He did state that he played less than an hour a day but only at his friend's house and listed his friend and his friend's parents as the ones that

chose and purchased the games he played. His favorite games were listed as "motorcycle" and "automobile" which were labeled as *none* in my chart since he couldn't name one game, even after I interviewed him. At first, I thought he may just have answered incorrectly or carelessly, so I observed him interacting with his 2 male team-mates for a full session before approaching him.

Seeing that the Learning to Play workshop was an elective, I was surprised to find someone who didn't want to play at all. Evan's teammates were calm, polite boys his age that enjoyed video games and had been playing 3 years for one and 5 years for the other. There was no animosity or ostracism in their relationship. He let his teammates play the entire session and sat on the edge of the bench looking relatively despondent. At no point did he request his turn. When the boys tried to hand him the gamepad in good sportsmanship when it was Evan's turn, he politely turned it down.

Evan is that illusive creature: the boy who is indifferent to video games. Like boys who do not like to play football or soccer, Evan was conscious that his disinterest in video games went against social norms. He probably felt obligated to say he played an hour a day but only at his friend's house.

I asked him about his crossed out answer and if he was prevented from playing at home. No, the Xbox was in his living room and accessible to him if he wished. He was the youngest of 3 brothers, and only his oldest brother played on the Xbox. Evan simply did not find playing video games very interesting. He would agree to play at his friend's house when his friend suggested it; he acquiesced to please his friend. They played driving simulation games in races against each other, but this was not significant enough for Evan to remember the name of any games he played with his

friend. He didn't leave the favorite game section blank or write "none;" he wrote down what he could remember. One game was driving a motorcycle and the other was driving in an automobile; their titles did not merit memorization. On the final alternative pastime question on the back, he stated that board games would have been his preferred activity.

I asked him how often he went over to his friend's place and if he played video games every time he went. He said he went to his friend's home about once a week and did not systematically play video games each time, only when his friend requested it. In other words, Evan played 1-2 hours a *month* or an average of about 2-4 minutes a day; this was definitely less than an hour a day.

Evan's form tried to mask his disinterest in video games, because he realized that his lack of enthusiasm for the Learning to Play workshop was going against the grain of his male classmates. On the form he answered that he enjoyed playing because "it's a fun pastime like anything else." He didn't like the challenge or winning.

Evan said he had a year's gameplay experience but acted like a beginner. Perhaps he was nervous about performing in front of the other boys. Evan acted in the stereotypical way we expected beginner girls to act around video games in public settings. On the few occasions I saw him play simulation games like *Race The Sun*, he handed back the gamepad to his teammates after his first crash. I never saw him venture to an unmanned station to play more privately. He stoically sat through the sessions, bored and unenthusiastic.

I did not come across another boy like Evan in any other session. Even the most reluctant child would take the gamepad and give it a try when it was his or her turn. The nature of an elective workshop would normally reduce the chances that a child would engage in an activity against his or her will, but how many boys like Evan were simply able to choose another ARE workshop?

6.3.2.3 Outliers and Edge Cases

Why focus on these two types of edge cases? Both the young gamer girls and the non-gamer boy transgress gender roles in their love of or indifference to video games. Sara and Mary's gender transgression earns culturally co-constructed capital in that they are moving from an inferior hierarchical position to a socially dominant one. Culture defines masculine activities and professions as superior in value to feminine activities and professions through wage differences, accolades, promotions, etc. Gamer girls and women who transgress into masculine activities and professions may minimize their performance, but many are often proud of their transgression.

Evan's gender transgression is more delicate and subtle. He is aware of the gender hierarchy, and the social price to pay for not being into hegemonic masculinity. Evan does not want to be labeled a sissy. It's his right to not enjoy video games. He clearly doesn't want to stigmatize himself, so he does not complain about how bored he is or talk about how little enjoyment video games bring him. Evan performs the strictly minimum-required performance to not draw attention to himself; he sits patiently waiting for the session to be over.

While Evan, Sara and Mary may be the outliers of their group, examining the social pressures that these edge cases must negotiate or perform allows us to shed light on gender and technology stereotypes.

If we focused on means and modes, we could say that boys and girls both enjoyed playing these gender-neutral video games equally, and there were no obvious differences in their gameplay performances. Even though girls had slightly less access to games and hardware, they showed the same level of engagement as boys in gameplay.

The public open-space layout did not affect the anxiety levels of the children who chose their stations as a group according to the games that were available on them. In the second half of sessions, once their questionnaires were filled out, boys and girls would wander to available game stations to have more play opportunities. Aside from Evan's rare foray away from his group, beginners were not necessarily timid and anxious. Lola, a 9 year-old extraverted beginner, did not hesitate to grab the gamepad out of 11 year-old Jared's hands to try out a game she was excited to try for the first time. Jared was good-natured and androgynous; he got along with all the girls and boys in his group. Lola was later assigned to a group with socially awkward hardcore gamer, 11 year old Kevin. She never grabbed the gamepad away from him and pleaded and nagged Kevin to let her have her turn. In other words, context for Lola's assertive gameplay was important and differed according to her groupmates.

Would there have been greater variations in gender performance if the video games presented at the center were themselves more stereotypically gendered (e.g. FPS and combat games for the boys, and Sims and dance games for the girls)? Would this have

affected group dynamics and gameplay negotiations? Perhaps, but I was thankful that the games' gender-neutrality kept that dimension as muted as possible. The video game center valorizes video games as something for everyone, including females and the elderly. Even if this was not stated explicitly, by virtue of hosting relatively unknown artistic and independent games, they created an environment that removed the privilege of gaming experience, often a masculine privilege, to level the playing field.

7. Conclusion: Doubt and Crisis

The many ingredients brought forth in this investigation are complicated to fit together into a coherent recipe, like trying to mix broccoli into a dessert. Feminist values are the broccoli — good for everyone, but difficult for some to swallow some. Games are the dessert. One central ingredient that will continue to come up from pragmatic semiotics is doubt— the enabler of crisis and change.

By focusing on reception and production, we can begin to tease out how some of the less evident elements of the gender and video game debate play themselves out in our culturally-constructed gender ideologies and macro-semiosis.

Video games can help in the acquisition of tech savvy, which may in and of itself justify or encourage someone to go into the ICT field through a trickle-down-effect resulting from pleasurable video gaming experiences. However, girl games in and of themselves have failed to bring girls and women into game design, development, and production because by their defining females as frivolous technological outsiders, they reinforce technology's association with masculinity. As we saw in Chapter 5, only a handful of the passionate, resilient women currently working in the field even mentioned video games in their list of favorite childhood toys or as a career influences or motivators. So video games are not the only technological gateway for women.

7.1 Parental Doubt

In Chapter 6 we saw how Parisian parents perpetuate the belief that technology is a

discipline for boys. They do this through their actions, parental attention and financial investments. According to children's self-declarations, parents of boys invested more in equipment purchases and paid video game titles, provided more input into a male child's game selection, and played more video games with their male children. This finding of gendered domestic differences in video game expenditure, attention and access deserves to be explored in greater detail in follow-up studies and in other milieus. Harvey (2016) and others understand the difficulty of ethnographic video game studies in the domestic context. Since my research did not include the children's parents, we must rely on children's perception of their technological access, domestic policy, gameplay experience and enjoyment.

Without active encouragement from their parents, we saw how two passionate gamer girls from very different milieus were able to take advantage of relative parental inattention - as the youngest children in large families with access to a wide variety of game titles - to develop real tech savvy and gamer capital. While I saw girls passionately engaged in the gameplay of creative independent titles, these girls rarely had access to technology beyond handheld consoles and shared touchscreens devices. Girls had more screen-time limits to play only on weekends. Girl's game titles were mostly free-to-play or common Nintendo games that rarely incite addictive behavior, and so girls stopped playing on their own, reifying parents' belief that "girls are just not into video games." Unfortunately it seems to be that the only way girls had the freedom to pursue technology on equal footing with boys was by making the most out of technological access and unsupervised time provided by a large family's relative domestic chaos.

Parent's belief in the unsuitability of technology for their daughters continues to disadvantage girls. From this, girls will accumulate many other social cues that will increasingly make them doubt their abilities in STEM. Why go into a field if you do not believe that you are going to succeed?

7.2 Doubt in ICT

Certain researchers like Wachter-Boettcher (2017) and Cockburn (1983, 1988, 1991 & 1993) doubt the sincerity of ICT management's lip service to really wanting an increase in diversity of its design and production teams. Wachter-Boettcher believes ICT's counterfeit diversity initiatives enable neoliberal capitalist interests to keep the technology sector as deregulated as possible by cultivating a monoculture that silences critique and dissent. Cockburn argues that masculine technological control reorganizes and reasserts itself to divert and resist feminist change in technological sectors: by creating masculine production environments, by redefining qualifications through trade union representation, and by creating standards defined by white males that all Others (women, ethnic minorities, the disabled, LGTBQIA, etc.) must adapt to by hiding their differences. Wachter-Boettcher's and Cockburn's arguments are very persuasive and allow feminists to understand that politely waiting in the sidelines for space to be made for them in ICT production will not happen without a backlash from the men fearing the loss of their male privilege. Men — who fear that their averageness will not go unchallenged in a level playing field, resulting in the loss of their social standing in a brutal neo-liberal order — enter a state of masculine crisis.

As we saw in Chapter 4 - and in Isabelle Collet's research - a steady stream of technophilic women do not hesitate to doubt and brave cultural norms to engage in technological professions. What differentiated these women are their rebellious personality preferences. They are less susceptible to rules, conventions and norms. Most of these women would probably wind up in ICT regardless of girl games, because of their appreciation of science and technology. However, women's percentages continue to be dwarfed by the increasing number of men entering these prestigious, lucrative and prospering fields.

7.3 Doubt in Girl Games

Girl games, especially in their current incarnation, create digital consumers, not digital producers. If we are honest about wanting to create female technological consumers and users of technological tools — such as social media producers that usually work for nothing and create great wealth for social media corporations through their accumulation of big data and advertising revenues— then we can say, "mission accomplished." Girl games have moved away from their feminist entrepreneurial beginnings and have turned into pure marketing products less about developing tech skills and comfort than reinforcing toy brands or creating advertising revenue. Those early feminist entrepreneurs, like Brenda Laurel, had the difficult task of making their humanist ideology commercially viable in a practically non-existent market. The products had to find audiences rapidly in order to maintain their place on store shelves, and so they were obliged *"to meet girls where they were"* if they wanted to survive commercially. We can only regret the benevolent ambition of the feminist pioneers.

Girl games essentialize femininity and circumscribe an area of activity for girls that is creatively limiting. Girl games inadvertently reinforce the status of women in STEM as the Other, of standing out from the masculine norm. They inadvertently tell girls that they are technological outsiders and that regardless of their interests, they are better off keeping up appearances and learning to get satisfaction and self-worth from the care and service of others: animals, children, boyfriends, and hopefully someday, a husband. Girl games, despite its gender-stereotype-reinforcing content, could potentially help those girls growing up in highly reactionary households, and those with restrained technological access, acquire technological savvy under the radar. We saw, in Chapter 5, that some women entered ICT disciplines in active rebellion against their conservative upbringing. It is disheartening that the only way some parents could make technological toys available to their daughters is by wrapping those games in cultural gender stereotypes that relegate feminine agency to subservience or female objectification.

If girl games rarely transcend consumerist ambitions to encourage active participation in game production, there are a few bright notes on the horizon. For one, distribution and marketing is no longer reliant on stores to sell games in physical boxes. Downloadable software through different application "stores" (i.e., iOS App Store, Android, Windows, Mac Store, Steam, and all console manufacturers) have changed the rules of how software is financed, produced, made, marketed, and distributed. Middle-ware technology like *Unity* lowers the technological threshold for making video games. Xbox Live, Steam, and app stores for smartphones and touchscreen devices allow an entire industry of independent game developers to produce and

release games, bypassing the console manufacturers' tight controls. The independent video market is making some truly amazing, genre-bending online experiences. *Minecraft* began that way. Some developers may yet fill the vacuum left by earlier feminist entrepreneurs but this time without having to worry about "meeting girls where they are," since in the last 20 years, girls have caught up on the gender-divide on the consumer-end.

7.4 Gender-Neutralized Technology

The starting point for my research began six years ago with Phase 1 of McIntosh's 5 Phases of Curricular Revision (1983, 1990)[210]: the absence of women in technology. How do we encourage women's desire to enter the ICT Field? How can we build women's resilience to gender stereotypes and stereotype threat? Each phase of my research brought me a step further in McIntosh's curricular revision. I focused on Phase 2 to understand women's achievements in technology and software development. What differentiated these women? In Phase 3, "women as an anomaly," I looked at how they positioned themselves to social rules and norms through personality preferences and sex-role identification. I looked at how kids negotiated video game play at the after-school workshop. I have since progressed to Phase 4: women as technology. Women have always been involved in technology, in subservient positions as "computors," lab assistants, assemblers of machines, and data entry staff. Technological women, like nurses and modern homemakers, are

[210] McIntosh, P. (1983). Interactive Phases of Curricular Re-Vision: A Feminist Perspective. *Multicultural Prism : Voices from the Field*. Wellesley, MA: Center for Research on Women. McIntosh, P. (1990). Interactive Phases of Curricular Re-Vision: A Feminist Perspective. *Multicultural Prism : Voices from the Field*. Wellesley, MA: Center for Research on Women

unfairly described as unskilled and incompetent as the means to better devalue or ignore their contributions to society or the economy. While women score higher on educational exams, why exactly are we not more present in the upper management of corporations and higher government offices? Perhaps it is due to our myths and beliefs of women being the weaker sex, emotionally unstable (or too boring and stable, if it suits the occasion), and technologically incompetent? Should we even care about what angry disenfranchised gamergate foot soldiers think about women's video game illegitimacy? I argue that they are a red herring and a waste of energy.

Belief is the opposite doubt. Feminist discourse is instating doubt in these myths by bringing up lack of diversity in ICT as a problem, a crisis leading to research for new solutions. Lack of diversity is brought forth as an unnatural state. This articulation can lead to the questioning of beliefs in those that do not doubt just yet. Research in corporate culture, STEM education, social psychology, and media representation are making multipronged headway towards identifying different aspects of the diversity problem. My automated Google searches on gender & technology and gender & video games bring ever increasing numbers of articles that appear in more and more diverse countries, including from Asia. Girl-only programming initiatives like Women Who Code or Black Girls Code[211] as possible solutions are being tested with greater frequency and success. This steady stream of questioning instills doubt in masculine technology dominance.

[211] http://www.blackgirlscode.com or https://www.womenwhocode.com

Doubting the status quo of the hacker begins to plant doubt in the minds of girls who have been fed a steady diet of “girl power!” boosterism without the tools, means, and sincerity to back them up. Girl games - sending mixed signals to girls that they are perfect the way they are while maintaining the status quo to reinforce appearance and caretaking preoccupations — are one such unsuccessful venture in the search to undermine masculine technological hegemony.

In Chapter 4, we saw that there was an absence of women with Sensing personality preference that tend to rely more on rules to store information and make decisions. The uncritical belief in gender stereotypes makes Sensing women more prone to avoid STEM professions believing they are unsuited for them. Gender neutrality is a prerequisite to attract technically competent Sensing young women to STEM — who may not be as individualistic, politically motivated, or prone to questioning rules, norms or stereotypes as those with iNtuition preferences— so that they may imagine themselves both studying and working in a creative technical profession, not as token "others" but as common team members.

How can we begin to move the demarcations of gender stereotypes that have significant inertia, whose unconscious stability enables rapid, efficient decision-making and make them so difficult to redefine? Cultivation theory may provide one strategy, but continued feminist pressure demanding accountability and searching/testing for new strategies must be maintained.

7.5 Cultivation Theory

Games, like all media, are artifacts produced by a culture with beliefs, habits and values and are socially defined and maintained. A sexist or violent video game, in and of itself, does not suddenly make a person sexist or violent. However, an artifact vehicles messages that can reinforce other social values held dear by a society. For example, Japan produces video games that are considered hyper-violent and sexually-deviant but cultural factors, like tight gun control and a devaluation of individuality in favor of social cooperation, means that the meso-semiosis of its cultural artifacts (like video games or mangas) are not scape-goated at the relatively few outbursts of violence in Japanese society. In other words, social values — and the legislations, myths, stereotypes, and ideologies that reify these values — create the context for semiosis: influencing which phaneron become a sign as well as the interrelation between the sign's triadic elements (in micro-semiosis), how signs are interconnected (in meso-semiosis) and what ideologies emerge (in macro semiosis).

Cultivation theory by Gebner & Gross (1976) was developed from studies on violence in American culture initially funded by the Lyndon B Johnson administration to determine the influence of television violence on American audiences. Their theory states that *"Television is a medium of the socialization of most people into standardized roles and behaviors. Its function is in a word, enculturation"*. (Gerbner &

Al, 186, p 17)[212] Over prolonged exposure, television viewers are “cultivated” to its social representations that slowly shift from one epistemological position to another.

According to this theory, popular television shows like *Modern Family* in the US that depicts the unthreatening "normalcy" of a gay couple with an adopted child, especially in comparison to two highly dysfunctional heterosexual couples, may have done more to promote social acceptance of homosexuality in America than two decade of gay rights activism. Comparing how homosexuality on television has evolved from the depictions of deviant social outcasts — alone and miserable —to more complex and nuanced portrayals: *Modern Family* (safe & boring suburban homosexuality for the masses), *Game of Thrones* (unfair, harsh homophobia imposed on a secondary character), *Queer as Folk* (homosexuality as the cultural norm in San Francisco), and *Faking it* (pretending to be gay to be cool in high school). Showing the sexual, complex normalcy on television of what was once a taboo subject has lead over time to increased acceptance of homosexuality and subsequent majority approval of its legislative agenda like same-sex marriage.

Media evolves, and while this theory is based in “passive” television viewing, video games’ popularity and media success can be added to other internet-based viewing habits. No one in my family, for example, watches any programmed television aside from a news channel in the morning. Our media consumption consists of watching

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[212] Gerbner G., & Gross L. (1976). Living with television: The violence profile. *Journal of communication*, 26(2), 172-194.

Gerbner, G.; Gross, L.; Morgan, M. & Signorielli, N. (1986). "Living with television: The dynamics of the cultivation process". In J. Bryant & D. Zillman. (Eds.) *Perspectives on media effects*. Lawrence Erlbaum Associates. pp. 17–40.

series, films and shows on Netflix and Youtube, and playing video games. Each person curates his or her media habit. Repeated exposure to positive representations in these new media should therefore also alter one's perception of reality.

If we apply this theory to the depiction of women in STEM, they are now entering the same "transformative complexification" phase that homosexuality's media representation went through. Stereotypical ICT and scientific role models in television series like *Big Bang Theory* and *IT Crowd* — strident, socially inept scientific women versus technologically incompetent "normal" women — have evolved into shows like *Halt and Catch Fire* (female engineers in the early personal computing revolutions), *NCSI*, *CSI* (technical women in service of crime victims) and movies like *Imitation Game* (Joan Clarke and her adventures with Alan Turing) and *Hidden Figures* (African-American NASA female mathematicians). These depictions present a more complex, positive and nuanced depiction of technical women, show the challenges and unvarnished resistance these women come up against, as well as the gender imbalance of ICT and STEM. Depictions of technical women's normalcy are highly welcomed if they can make people doubt gender stereotypes of incompetence and social ineptitude — the more, the better.

Cultivation theory requires patience to slowly change gender ideologies by cultivating a mass consensus. Can this be done by better representations of technical females in other media like video games?

7.6 Doubt and the Boomerang Effect

My dissertation aims to generate doubt in masculine technological dominance. In her SWSX EDU keynote speech in March 2018, Danah Boyd talked about the dangers of excessive doubt in current U.S. discourse. She proposes that doubt is being "weaponized" by seasoned veterans who have specific cultural agendas and are cognizant that they are spreading misinformation. The racist, misogynistic #gamergate movement may believe they are fighting "corruption in video game criticism;" however, the movement has morphed into a reactionary movement that manifests death threats against anyone that speaks out against the white male monoculture.

By sowing the seeds of doubt in the minds of viewers who might mistrust or doubt the media (and authority figures in general) — i.e., by gaslighting[213] or trolling the media — a boomerang effect is created that increases the belief in conspiracy theories or "alternate facts" the more an authority figure tries to deny it. In other words, reasserting a value like "women are equal" from a position of authority reifies doubt about the statement's validity.

> *"Linguistic and communications skills are not universally valued. Those who do not define themselves through this skill loathe hearing the never-ending parade of rich and powerful people suggesting that they're stupid, backwards, and otherwise lesser. Embracing being anti-PC has become a source of pride, a tactic of resistance. Anger boils over as people who reject "the establishment" are happy to watch the elites quiver over their*

[213] Gaslighting comes from a 1944 film about domestic abuse whereby a husband makes a wife think she is crazy by creating doubt in a person's sense of truth and reality. This is now synonymous with manipulating (someone) by psychological means into doubting their own sanity, a tactic frequently used by the Trump administration by repeating falsehoods with no repercussions from his supporters.

institutions being dismantled. This is why this is a culture war. Everyone believes they are part of the resistance."(Boyd 2018)[214]

This authority figure can be a governmental organization, college professor, the CDC, the FBI, doctors, mainstream press, etc., and simple denial of a ridiculous theory creates an incentive to self-investigate that can lead down Google's rabbit hole of manipulated search results to create highly unpredictable intellectual conclusions.[215]

> *"Because of my privilege as a scholar, I get to see how expert knowledge and information is produced and have a deep respect for the strengths and limitations of scientific inquiry. Surrounded by journalists and people working to distribute information, I get to see how incentives shape information production and dissemination and the fault lines of that process. I believe that information intermediaries are important, that honed expertise matters, and that no one can ever be fully informed. As a result, I have long believed that we have to outsource certain matters and to trust others to do right by us as individuals and society as a whole. This is what it means to live in a democracy, but, more importantly, it's what it means to live in a society.*
>
> *In the United States, we're moving towards tribalism, and we're undoing the social fabric of our country through polarization, distrust, and self-segregation. And whether we like it or not, our culture of doubt and critique, experience over expertise, and personal responsibility is pushing us further down this path. Media literacy asks people to raise questions and be wary of information that they're receiving. People are. Unfortunately, that's exactly why we're talking past one another."* (Boyd 2018)[216]

Boyd's recommendations to counter this tendency are to focus on strengthening people's cognitive skills rather than on the establishing the veracity of facts that can be manipulated through multiple epistemologies; "Asserting authority over epistemology is not working."

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[214] https://points.datasociety.net/you-think-you-want-media-literacy-do-you-7cad6af18ec2

[215] #pizzagate around the 2016 Trump-Clinton U.S. election is a perfect example of this phenomenon.

[216] Ibid https://points.datasociety.net/you-think-you-want-media-literacy-do-you-7cad6af18ec2

One needs to recognize the students' fault lines (as actors of Reception), not the fault lines of the internet media landscape that cannot be muzzled or controlled, nor should it. One should focus on creating media literacy by the receptor, not the diffuser, to fight gaslighting and its boomerang effect. Here are Boyd's recommendations:

1. **Beware para-social interactions**, i.e., knowing and identifying too closely with the messenger.
2. **Develop grounded empathy**, and build emotional distance by putting strategies in place. A person must interrogate their own psychology to create an objective perspective that can be helpful for analysis because it creates a cognitive disconnect, particularly difficult when reading the ideas of someone that one strongly disagrees with.
    a. Separate out the different signals and narrow their scope,
    b. Read the text rather than viewing multimedia presentation,
    c. Take the information out of context.
    d. Focus on interrogating one's own psychology to create an objective perspective.
3. **Appreciate epistemological differences**. Why do people from different world views interpret information differently? Peirce would argue that an interpretant (used for semiosis) is *contextual*.
4. **Learn to hold on to your worldview while embracing someone else's**. This ethnographic practice is about learning to observe and empathize while keeping conscious distance as an observer. Debate teams are also required to

coherently hold on to someone else's perspective, regardless of one's viewpoint. This may be difficult with toxic content.

5. **Find cognitive glitches and identify confirmation bias**. When given coarse information, people have a tendency to fill in the blanks. This is where bias and stereotypes manifest themselves.

These strategies are meant to create enough cognitive distance to analyze underlying motives while maintaining one's beliefs. Doubt can lead to crisis and a search for new belief/habits.

7.7 Heuristics of Gender Neutrality for Children's Digital Experiences

As a UX designer and educator, recommendations for other designers confronted with navigating the same complicated landscape is of primary concern. In line with Cultivation Theory, I strongly encourage gender-neutralizing any cultural production, video games, books, mangas, particularly anything aimed at children or adolescents. By simply not targeting or assuming that one can only deal with 50% of the population in a target market, we should strive to find common ground without assuming the masculine overrides the feminine.

Game manufacturers began gendering its products hoping to reduce the in-family reuse of equipment like (bicycles), toys and games and thus increase sales. This toxic strategy reinforces stereotypes and other cultural myths that reinforce the gender hierarchy. Girl's and women's over-arching concerns about appearances reinforce the internalization of female objectification, creating phenomenological repercussions in sports, self-esteem, and confidence. Care-taking and devotion to others should be

cultivated in boys as much as in girls, and not just in heroic public acts but in private, unspectacular acts as well. Both appearance and care-taking when expected solely from girls and women creates a huge deficit in the time and attention they can devote to striving for achievement.

If we want to deconstruct the macro-semiosis that genders the scientific and technological disciplines as masculine pursuits, we need to rethink the ways that our artifacts and their metabolic cycles reinforce this. For this ultimate goal, I humbly propose eight heuristics of gender-neutrality that designers should take into consideration when designing children's digital experiences. My heuristics respond to Brenda Laurel's design heuristics (section 2.3.4) that embraced certain biological determinist aspects and considered designing just for girls as a worthwhile strategy. My heuristics are also in total opposition to the current crop of girls games described in section 2.4.4 that seek little beyond reinforcing consumerism and gendered social expectancies. Technology's social context has changed, and we now have to actively create common experiences for children.

1. **Design for children whenever possible, but do not confuse the category "children" and "boys."** Masculinity is not a neutral, universal category. By using the term "children" when using masculine standards of boys as the social norm — and treating girls as a separate special interests group —simply reinforces masculine hegemony. Playmobil uses this approach. Their games are categorized as *children* and *girls*. Blue boxes contain children's toys that propose many "boy" themes (pirates, knights, super-agents, police, etc.) under the guise of gender neutrality. The pink boxes are for domestic-related subjects meant for a special

category of children: girls. Likewise, children's literature classics that focus primarily on masculine themes are not gender-neutral either (see also point 7).

2. **Avoid the essentialization of "boy" and "girl" categories** by avoiding the fallback to gender stereotypes in interests, behaviors, game and play preferences, social contexts, colors, materials/finishes or subject matter, whenever possible.[217] Below are some common gender stereotypes:

   Boys = outdoor adventures; experience, skill, and courage; competitive; love of action and fast reflex; love of violence and aggressive content; use of dark or saturated colors, especially blue.

   Girls = indoor adventures; timidity, lack of experience, fear and lack of passion; love of narrative and reflection, or worse, narcissism and superficiality; focus on grooming, fashion, relationships, and care taking; use of light pastel colors and glitter.

3. **Consider how masculine and feminine role-models are portrayed**, especially adult roles in media for young children. How adults are portrayed matters immensely to children, e.g. avoid the stereotype of the mother in kitchen and the father sitting reading the newspaper. Show masculine role-models engaged in the care of others and showing emotional depth, and show feminine role-models manifesting agency outside the house.[218] This is the social norm; our media should reflect this.

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[217] Turner-Bowker, D. M. (1996). Gender stereotyped descriptors in children's picture books: Does "Curious Jane" exist in the literature?. *Sex roles*, *35*(7-8), 461-488.

[218] Grauerholz, E., & Pescosolido, B. A. (1989). Gender representation in children's literature: 1900-1984. *Gender & Society*, *3*(1), 113-125. Kortenhaus, C. M., & Demarest, J. (1993). Gender role stereotyping in children's literature: An update. *Sex roles*, *28*(3-4), 219-232. Tepper, C. A., & Cassidy, K. W. (1999).

4. **If you must design for girls, avoid gendered aesthetics,** especially if your target market is adolescent. Pink is a marketing meso-semiosis aimed at parents and distributors to easily identify products for girls. (LoBue & Deloache 2011; Weisgram & Al. 2014; Cunnigham & Macrae 2011; Wong & Hines 2015b; Fine & Rush 2016)[219] Unless your design research identifies pink or pastels as your target-market's preference, do not assume pink or pastels are the go-to color for girls. In adolescent and adult women, gender stereotyped aesthetics are a frequent target of ridicule and generate backlash towards inappropriate design and communication strategies.[220] Using neutral aesthetics allows for non-binary appropriation. Boys also like reading and horses, and they should not be repelled by aesthetic codes meant to grab parental attention in a toy store.
5. **If you must design for boys, feel free to use gender-transgressive aesthetics and subjects**. Boys deserve a reprieve from masculine hegemony with light colors, some sparkle, cuteness, and encouragement of care-taking of others in private settings, beyond heroic public feats.[221] In *God of War* (2018), even Kratos learns to

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Gender differences in emotional language in children's picture books. *Sex Roles*, *40*(3-4), 265-280. Dietz, T. L. (1998). An examination of violence and gender role portrayals in video games. *Sex roles*, *38*(5-6), 425-442.

[219] Cunningham, S. J., & Macrae, C. N. (2011). The colour of gender stereotyping. *British Journal of Psychology*, 102(3), 598-614. LoBue, V., & DeLoache, J. S. (2011). Pretty in pink: The early development of gender-stereotyped colour preferences. *British Journal of Developmental Psychology*, 29(3), 656-667. Weisgram, E. S., Fulcher, M., & Dinella, L. M. (2014). Pink gives girls permission: Exploring the roles of explicit gender labels and gender-typed colors on preschool children's toy preferences. *Journal of Applied Developmental Psychology*, 35(5), 401-409. Wong, W. I., & Hines, M. (2015b). Preferences for pink and blue: The development of color preferences as a distinct gender-typed behavior in toddlers. *Archives of sexual behavior,* 44(5), 1243-1254. Fine, C., & Rush, E. (2016). "Why does all the girls have to buy pink stuff?" The ethics and science of the gendered toy marketing debate. *Journal of Business Ethics*, 1-16.

[220] See the 2000+ user reviews of the « Bic for Her » pens : https://www.amazon.com/BIC-Cristal-1-0mm-Black-MSLP16-Blk/product-reviews/B004F9QBE6

[221] Diekman, A. B., & Murnen, S. K. (2004). Learning to be little women and little men: The inequitable gender equality of nonsexist children's literature. *Sex Roles*, *50*(5-6), 373-385. Anderson, D. A., &

be a father as he goes on his hack-and-slash adventures with his recently orphaned son.

6. **Avoid adding feminine stereotyped secondary characteristics to scientific or technological artifacts meant for child's play**. Not only do you artificially reduce your target market by 50%, this reinforces a gender-transgressive macro-semiosis that reifies science and technology as masculine. If science and technology is to lose it's artificial, culturally constructed masculine association, we need to treat it as a neutral territory, not a hostile one. Scientific or technological toys and games should be enjoyable to all children.
7. **Good narrative structure should be provided for everyone**. A good story is immersive and allows players to transcend the medium they are physically interacting with (e.g. mouse, screen, keyboard, touchscreen device, game controller, etc.) Encourage all children to read. Everyone deserves an interesting narrative with complex characters (of any gender) — that can have exciting adventures and show weaknesses — that fan culture can embrace and develop.[222] Note: My comment about gender-representation of role models is important here too. Pedagogical literature often assumes that "classics" are gender neutral and tend to heavily favor male protagonists, e.g. *Moby Dick* and *The Adventures of Tom Sawyer*, assuming boys will be disinterested in reading about female

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Hamilton, M. (2005). Gender role stereotyping of parents in children's picture books: The invisible father. *Sex roles*, *52*(3-4), 145-151.

[222] Jenkins, H. (2012). *Textual poachers: Television fans and participatory culture*. Routledge. Laurel, B. (2004). Narrative construction as play. *interactions*, *11*(5), 73-74. Laurel develops essentialist approaches to narrative play, but if we remove its gender essentialism, her recommendations can enrich the experiences of all children. See also: Rudman, M. K. (1995). *Children's literature: An issues approach*. Addison-Wesley Longman, 1 Jacob Way, Reading, MA 01867.

protagonists like in *Little Women* or *Pride & Prejudice*. Classic literature with female protagonists, by virtue of the author's restrictive context, tends to reinforce the domestic sphere as women's domain and the passive nature of female protagonists - who seek to survive/climb socially. While classic literature may make girls be incredibly thankful to not be born earlier, these novels also imply secondary status to female authors who, like 19th Century female painters, could only focus on domestic themes without social disapproval. While these women's social restrictions are infuriating, this literature also makes girls have doubts about their agency in a world that might not be as welcoming to women as they imagined. Contemporary literature (by virtue of women's liberation) has agentic female protagonists capable of heroism and sacrifice that may be better approaches to please children of both sexes.[223]

8. In video games, **provide optional gameplay variations depending on the skill levels and interests of players**, such as a tourist mode in adventure games, skipping fight scenes, untimed versions, alternate input devices, etc.

Wonderful examples of gender-neutral games are already being produced, just the list of titles from the Gaité Lyrique (Fig. 6.6) is an excellent starting point. I do not propose heuristics for gender neutral video games in the hopes of suggesting a formula to hit the game marketing jackpot. I am also not suggesting that retrograde canons of the video game industry – sexist and violent AAA titles or girl games —

[223] The *Hunger Games* and *Divergent* series are two obvious (if dystopian) children's novels with agentic female protgonists. Other excellent examples of gender neutral children's literature include *Pippy Longstocking*, *Diary of a Wimpy Kid,* and *Harry Potter*. I await the angry rebuttal from English literature majors.

need to be abolished. In a neoliberal society, artifacts will continue to be created if the audience is there to purchase them, but parents and children need to know there are better offerings out there and not assume that these titles are the best titles they can provide to their children.

Independent game culture needs to be encouraged to continue to take risks, to blur the lines between categories, genres and audiences. These alternative games simply need to reach bigger audiences because they are already being produced.

Parents need to be encouraged to not view video games solely as a waste of time or a bad influence on their children, but rather actively help parents curate better media consumption habits for their children. Automatically equating screen-time with negative influences simply transfers a child's curiosity to other sources of guidance that may, once again, lead to unpredictable conclusions. Video games can play a very positive role in a child's skill set development, but parents must implicate themselves in helping their children chose better video games — currently easier said than done.

7.8 Modernist Ideals in a Postmodern Context

Modernism is imbued with objective, universal, humanist ideals. (Habermas 1993)[224] Artists, designers, engineers and architects often believe their mission is a progressive humanist one — through the construction of artifacts to propose new and better ways of being. Postmodernism is about complexity, nuance, skepticism,

[224] Habermas, J. (1993). Modernity—an incomplete project. *Postmodernism: A reader*, 98-109.

contextualism, tribalism, and subjectivism. Girl games embody naïve modernist ideals in a complicated post-modern context.

An apt metaphor for the girl games movement can be found in the failed urban-renewal modernist high-rise projects built on the outskirts of U.S. cities in the 1950's and 1960's like the Pruit-Igoe housing projects in St. Louis, Missouri.[225] (1954 –1972). Based on the modernist ideals of Le Corbusier and the CIAM (*Congrès internationaux d'architecture moderne)* movement, these slum clearance projects were filled with utopian social ambitions to provide better housing for the masses. The repeated and spectacular failure of many of these housing projects show the limits of designing artifacts when some truly malignant social policies were in place and actively working against modernism's naïve, idealistic ambitions. High-rise modernist housing projects work well when they are racially desegregated and integrated into the urban fabric with adequate maintenance, social services, and public transportation.

Likewise, girl games (or video games for that matter) cannot overcome technology's pernicious masculine milieu. Believing that an artifact can convince someone to choose an education or career path that clearly signals that they are an outsider puts the onus on the player to adapt to the milieu. Aside from the recalcitrant minority of women who are less sensitive rules and whose resilience allows them to ignore or overcome negative stereotypes, most women will not choose a discipline if they think they will have to sharpen their pitchforks to storm technology' walls or to defend

[225] Designed by Minoru Yamasaki, the designer of the World Trade Center in New York, the housing project was a slum clearance project that opened in 1954 and began to be demolished in 1972.

themselves once inside. Girl games simply encourage a meso-semiosis of women's out-group status in ICT.

Just as racist laws and social policies undermined and squandered huge investments in U.S. public housing, technology's white male monoculture is what must first be made evident and neutralized if we wish to make headway with other strategies to correct the gender imbalance in ICT. Focusing on artifacts and hoping they can effectuate change through user-interaction is a losing strategy if an invisible and pervasive macro-semiotic context is actively and effectively working against this change.

7.9 Postmodern Barbarians at the Gate

In conclusion to the original aim of my research, getting more women into ICT production comes down to questioning the *raison d'etre* of technology's masculine monoculture. After 5000 years of patriarchy, the past 50 years has seen women making spectacular social advances in disciplines like law and medicine. ICT is one of the last bastions of male domination, but the friction of doubt is shedding light on the myth.

Doubt leads to crisis — not just in men who fear their loss of status, but also in women who have been taught to believe in their technological incompetence, regardless of their capabilities, performance, or interests. ITC's masculine monoculture is not natural; it is reinforced through gender and technology stereotypes that reify beliefs that one sex is more talented and suitable for complicated technological work and that this sex deserves better compensation.

ICT is in the midst of an economic war of the sexes. More precisely, gender and technology stereotypes are used to reinforce male economic domination, and any unfounded myth can be used to reinforce these beliefs: hormones, brain structures, motivation, or math skills. These need to be countered with pedagogy, patience, and perseverance.

Representation of women matters, but not just in video games — also on tv, in advertising, children's books, and movies. Representation of female scientists, programmers, and hackers needs to become less stereotyped. However, these concerns should not distract us from the bigger picture. ICT's white male monoculture and its insular shortcomings need to be made more visible through scrutiny and discussion. There is no incompatibility with female participation in ICT; there are only beliefs meant to protect its dominant minority.

7.10 Next Step: Discreet Action Research in ICT Education

In the fall of 2018, my gender and ICT research will continue past this dissertation through discreet action research at a prominent computer programming school in Paris, the Ecole 42 funded by French tech billionaire Xavier Niel. The prestigious, tuition-free, non-profit, non-degree granting educational institution has a 3 year program for 18-30 year olds and a special one year program for qualifying non-programmer tech industry "seniors" (over 45 years old) that I will be joining. Open 24 hours a day, Ecole 42's innovative curriculum is structured around peer-to-peer learning and group work in self-defined pathways. Its highly-competitive entry exam is a month long, 7-days-a-week immersive programming workshop called "the pool"

with 48-hour weekend projects that encourage crunch-time all-nighters with students sleeping (and hopefully showering) on the premises in the hopes of turning in a working project on Monday morning. “The pool” has a 30% percent dropout rate due to its frenetic pace and a 30% acceptance rate for those that remain to the end.

Ecole 42’s ideal student is a hype, young, obsessive hacker, a dated masculine stereotype that leads to unhealthy work habits and is often pinpointed as unsustainable for child-bearing women and incompatible with family life. While 21st century hackers may not go home to sleep, they are now expected to maintain a certain level of personal hygiene. A testament to the school’s workaholic ideal is displayed in its hallways and staircases lined with side-by-side towels drying on its handrails. There are as many private shower stalls as toilet stalls throughout the building.

My discreet-observer action research will be looking at how “innovative” educational programs continue to reinforce masculine hegemony in ICT through neo-liberal ideals that reify the well-established stereotype of the compulsive hacker (albeit one with better hygiene).

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9. Appendix

9.1 Bibliography of the Quantitative Meta-analysis of A-Publications

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9.3 Isabelle Collet's statistics from her PhD dissertation

Université Paris X Isabelle Collet

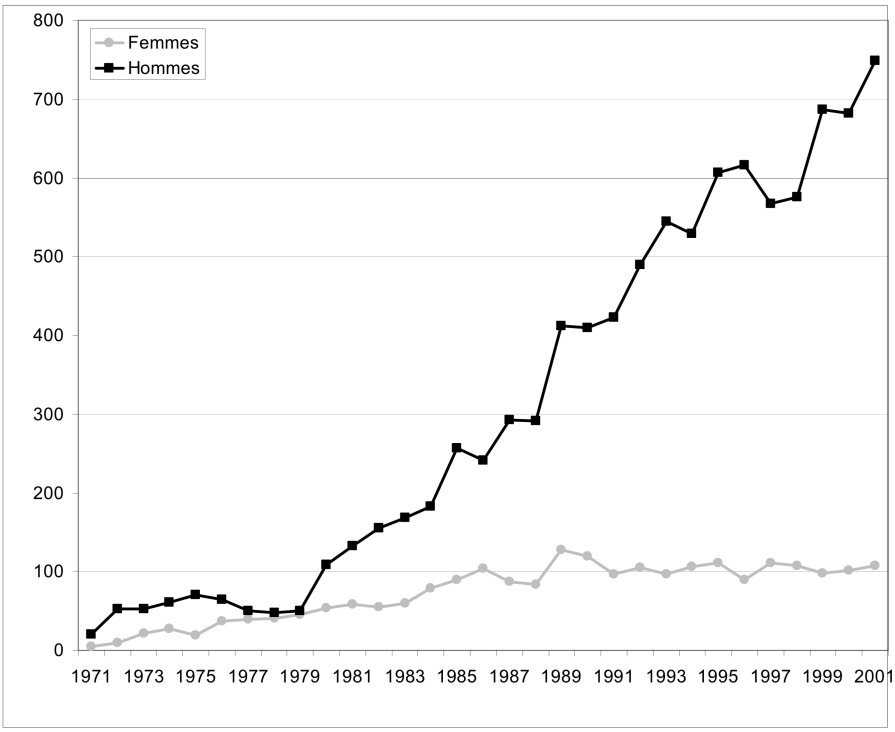

Figure 6 : Nombre d'étudiant-e-s diplômé-e-s de l'option informatique de 10 grandes écoles d'ingénieurs

(Collet 2005, 31)

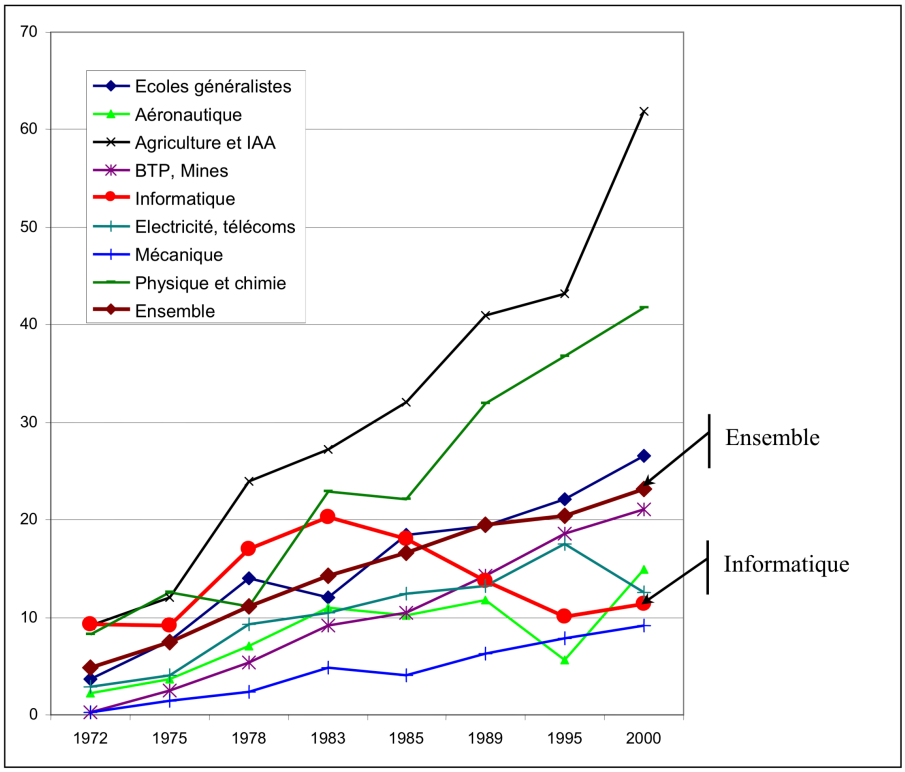

Figure 3 : Féminisation des écoles d'ingénieurs selon la spécialité (en pourcentage)

(Collet 2005, 28)

9.4 MBTI raw data results of women in game development

MBTI - Myers Briggs Type Indicators - for Women in Game Development									
Age	Nationality	Introvert	Extrovert	Sensing	iNtuition	Feeling	Thinking	Judging	Perceiving	MBTI
42	Belgian US	22			88	-25	25	-11	11	INTP
30	UK	-60	60		60	20		-20	20	ENFP
29	US	-67	67		38	25		44		ENFJ
50	US	-11	11		25	50		-11	11	ENFP
30	Spanish	-1	1		31	62		-11	11	ENFP
31	US	-33	33		25	50		-44	44	ENFP
35	US/Italy	11			38	-12	12	11		INTJ
44	FR	-44	44		50	75		22		ENFJ
33	US	22			38	50		1		INFJ
31	US	56			56	12		44		INFJ
45	US	-56	56		25	50		-44	44	ENFP
35	Canada	33		1	-1	-50	50	-11	11	ISTP
25	US	-22	22		50	62		-22	22	ENFP
32	US	78			62	-1	1	11		INTJ
43	US	33			62	-1	1	1		INTJ
34	UK	56			50	12		67		INFJ
31	UK	67		1	-1	25		1		ISFJ
30	UK	33			62	38		11		INFJ
50	US	33			12	62		56		INFJ
35	UK	-33	33		38	69		33		ENFJ
28	US	22			62	-12	12	11		INTJ
35	Polish	78			88	-1	1	50		INTJ
25	US	-1	1		50	-25	25	33		INTJ
28	US	11			38	-38	38	-11	11	INTP
35	Canada/US	78		25	-25	-38	38	78		ISTJ
43	Finland	44			38	50		22		INFJ
33	US	-89	89		75	50		11		ENFJ
39	US	56			38	25		67		INFJ
41	US/CA	11			62	-12	12	22		INTJ
35	Norway	-56	56		50	50		22		ENFJ
40	US	44			100	38		-11	11	INFP
30	US	11			62	12		56		INFJ
23	NZ	78			50	50		67		INFJ
32	US	78		1	-1	-25	25	44		ISTJ
30	US	56			38	62		11		INFJ
32	HK/US	11			62	38		67		INFJ
30	US	44			75	25		11		INFJ
30	Canada	56			44	-25	25	56		INTJ
36	France	22			25	38		22		INFJ
25	UK	-25	25		50	-25	25	25		ENTJ
49	UK	78			62	-35	35	56		INTJ

39	UK	44		6	-6	-100	100	44		ISTJ
49	UK	78			75	-88	88	67		INTJ
25	Netherlands	11			62	88		-44	44	INFP
40	UK	56			62	50		11		INFJ
35	US	44			38	-25	25	11		INTJ
46	US	44			88	25		44		INFJ
35	US	67			50	-12	12	-33	33	INTP
28	UK/CA	67			88	-38	38	56		INTJ
30	France	-11	11		88	-25	25	1		ENTJ
24	Brazil/Canada	44			75	-75	75	44		INTJ
30	US	78			38	-1	1	-22	22	INTP
25	US	-11	11	12	-12	-1	1	33		ESTJ
59	US	-11	11		12	-1	1	89		ENTJ
35	US	89			25	-50	50	-67	67	INTP
35	US	22			50	50		-11	11	INFP
25	US	44			12	25		-33	33	INFP
25	US	-11	11	1	-1	50		-33	33	ESFP
24	UK	33		1	-1	38		67		ISFJ
27	UK	-22	22		50	38		-28	28	ENFP
38	US	-56	56		75	-12	12	-44	44	ENTP
38	France	89			75	-88	88	22		INTJ
38	France	11			38	38		11		INFJ
50	American	67			25	50		11		INFJ
35	Italy	-11	11	12	-12	62		56		ESFJ
45	UK	50			20	-50	50	10		INTJ
35	Colombian/UK	56			25	-38	38	56		INTJ
32	UK	33			75	25		56		INFJ
32	US in UK	-22	22		38	-25	25	-22	22	ENTP
23	UK	11			50	-12	12	1		INTJ
52	UK	-1	1	1	-1	12		33		ESFJ
30	US	44			25	12		1		INFJ
35	UK	56			50	25		76		INFJ
28	US	-78	78		75	-12	12	33		ENTJ
40	CA	-67	67		75	62		22		ENFJ
37	Canada	-39	39		6	44		11		ENFJ
41	US	11			25	12		78		INFJ
27	US	-1	1		75	12		-1	1	ENFP
34	UK/AUS	67			50	38		33		INFJ
40	US	33			38	-25	25	89		INTJ
25	US	-78	78		50	-12	12	67		ENTJ
23	US	-44	44		25	-1	1	56		ENTJ
30	US	22			38	50		33		INFJ
30	Fr/UK	-50	50		56	62		56		ENFJ
38	Serbia/UK	-67	67		12	25		44		ENFJ
35	US	-89	89		25	-75	75	33		ENTJ
27	US	11			25	38		11		INFJ

54	UK/Belgium	44			88	38		6		INFJ
40	UK	56		50	-50	38		-22	22	ISFP
39	US	-22	22		38	-38	38	44		ENTJ
33	US	56		62	-62	62		22		ISFJ
23	US	-11	11		88	31		11		ENFJ
42	US	11			50	50		56		INFJ
30	Romania	33			88	-25	25	11		INTJ

Design/Writing

Art/Sound/Animation

Programming

Management

9.5 ARE Questionnaire Design

9.5.1 Questionaire design from session 1 – April-June 2014

9.5.1.1 Front

COMPRENDRE LE
JEU VIDÉO !
ch.1

Pour cette séance, vous allez remplir chacun un questionnaire sur vos habitudes de jeu, il n'y a pas de «bonne» réponse, juste les vôtres.

PRÉNOM ..... PRÉNOM ..... PRÉNOM .....

Mon âge : .....
Je joue aux jeux vidéo depuis :
☐ 1-2 ans
☐ 3-4 ans
☐ 5-6 ans
☐ 7+ ans
☐ Je débute
.....
À la maison je joue aux jeux :
sur une console (Xbox, Playstation, Wii etc.)
☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent
☐ Nous n'en avons pas
Si tu as une console, la ou lesquelles ?
.....
sur console portable (PSP, 3DS, GameBoy etc.)
☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent
☐ Nous n'en avons pas
J'ai une console et c'est une :
.....
Et mes frères / sœurs / parents ont :
.....

Mon âge : .....
Je joue aux jeux vidéo depuis :
☐ 1-2 ans
☐ 3-4 ans
☐ 5-6 ans
☐ 7+ ans
☐ Je débute
.....
À la maison je joue aux jeux :
sur une console (Xbox, Playstation, Wii etc.)
☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent
☐ Nous n'en avons pas
Si tu as une console, la ou lesquelles ?
.....
sur console portable (PSP, 3DS, GameBoy etc.)
☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent
☐ Nous n'en avons pas
J'ai une console et c'est une :
.....
Et mes frères / sœurs / parents ont :
.....

Mon âge : .....
Je joue aux jeux vidéo depuis :
☐ 1-2 ans
☐ 3-4 ans
☐ 5-6 ans
☐ 7+ ans
☐ Je débute
.....
À la maison je joue aux jeux :
sur une console (Xbox, Playstation, Wii etc.)
☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent
☐ Nous n'en avons pas
Si tu as une console, la ou lesquelles ?
.....
sur console portable (PSP, 3DS, GameBoy etc.)
☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent
☐ Nous n'en avons pas
J'ai une console et c'est une :
.....
Et mes frères / sœurs / parents ont :
.....

atelier Apprendre à jouer à la Gaîté lyrique, chapitre 3 : Pourquoi on aime les jeux vidéo ?

9.5.1.2 Back

sur téléphone ou sur tablette tactile

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Nous n'en avons pas

As-tu un téléphone ? Si oui, lequel ?

.....

Et à la maison / mes parents ont :

.....

Mes trois jeux préférés sont :

.....

.....

.....

Mes matières préférées à l'école :

.....

Si vous avez un ordinateur et/ou internet à la maison :

Je regarde des vidéos sur le net

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Je n'ai pas la permission

☐ Je regarde des vidéos sur le jeu vidéo

J'écris des mails

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Je n'ai pas la permission

Je vais sur les réseaux sociaux

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Je n'ai pas la permission

Je créé des contenus (je poste des vidéos, des textes, des photos en ligne).

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Je n'ai pas la permission

Métier de ma mère :

.....

Métier de mon père :

.....

sur téléphone ou sur tablette tactile

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Nous n'en avons pas

As-tu un téléphone ? Si oui, lequel ?

.....

Et à la maison / mes parents ont :

.....

Mes trois jeux préférés sont :

.....

.....

.....

Mes matières préférées à l'école :

.....

Si vous avez un ordinateur et/ou internet à la maison :

Je regarde des vidéos sur le net

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Je n'ai pas la permission

☐ Je regarde des vidéos sur le jeu vidéo

J'écris des mails

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Je n'ai pas la permission

Je vais sur les réseaux sociaux

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Je n'ai pas la permission

Je créé des contenus (je poste des vidéos, des textes, des photos en ligne).

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Je n'ai pas la permission

Métier de ma mère :

.....

Métier de mon père :

.....

sur téléphone ou sur tablette tactile

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Nous n'en avons pas

As-tu un téléphone ? Si oui, lequel ?

.....

Et à la maison / mes parents ont :

.....

Mes trois jeux préférés sont :

.....

.....

.....

Mes matières préférées à l'école :

.....

Si vous avez un ordinateur et/ou internet à la maison :

Je regarde des vidéos sur le net

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Je n'ai pas la permission

☐ Je regarde des vidéos sur le jeu vidéo

J'écris des mails

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Je n'ai pas la permission

Je vais sur les réseaux sociaux

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Je n'ai pas la permission

Je créé des contenus (je poste des vidéos, des textes, des photos en ligne).

☐ Jamais ☐ Un peu ☐ Souvent ☐ Très souvent

☐ Je n'ai pas la permission

Métier de ma mère :

.....

Métier de mon père :

.....

9.5.2 Questionnaire design from session 2 – Sept.-Dec. 2014

9.5.2.1 Front

présente-toi !

PRÉNOM .....

Depuis combien de temps joues-tu aux jeux vidéo (en années) :

.....

Tu joues : ☐ à la maison
☐ chez des amis
☐ autre (précise en-dessous) :

.....

À la maison, sur quoi joues-tu ? (ex : PC, PlayStation 4, smartphone, iPad, Atari 2600...)

.....

.....

.....

Et chez tes amis ?

.....

.....

Dans une journée, combien de temps penses-tu passer sur des jeux ?

☐ une heure ou moins d'une heure
☐ environ deux heures
☐ plus de trois heures

Est-ce que tu joues tous les jours de la semaine, ou seulement certains (lesquels) ?

.....

Qui choisit et achète les jeux auxquels tu joues, chez toi ou chez tes amis ?

☐ toi (tes amis)
☐ tes parents (les parents de tes amis)
☐ les deux à la fois

Je suppose que tu as déjà joué à des jeux déconseillés aux moins de 18 ans (si ce n'est pas le cas, passe cette question) comme GTA, Call of Duty, etc...
Si oui :

☐ tes parents t'en achètent
☐ tu les as achetés toi-même, tout seul
☐ tu y joues chez des amis, ou ailleurs

Indique tes trois jeux préférés, ou les trois jeux auxquels tu joues le plus souvent (si ce sont les mêmes, tant mieux !) :

.....

.....

.....

Pourquoi les aimes-tu autant (plusieurs réponses possibles) ?

☐ tu es fort(e) et tu aimes tout réussir dans ces jeux
☐ tu dois essayer plusieurs fois pour réussir et tu aimes t'améliorer à chaque fois
☐ tu aimes passer du temps à y jouer et cela te divertit, comme n'importe quel autre activité

Autre : .....

.....

9.5.2.2 Back

présente-toi !

Quand nous étions petits (ce n'était pas il y a très très très longtemps, merci), il n'y avait pas de smartphones, tablettes, consoles, pas non plus de jeux sur ordinateur (en tout cas pas des très passionnants).
À notre place, comment auriez-vous occupé le temps que vous passez aujourd'hui à jouer à des jeux vidéo ou sur internet ?

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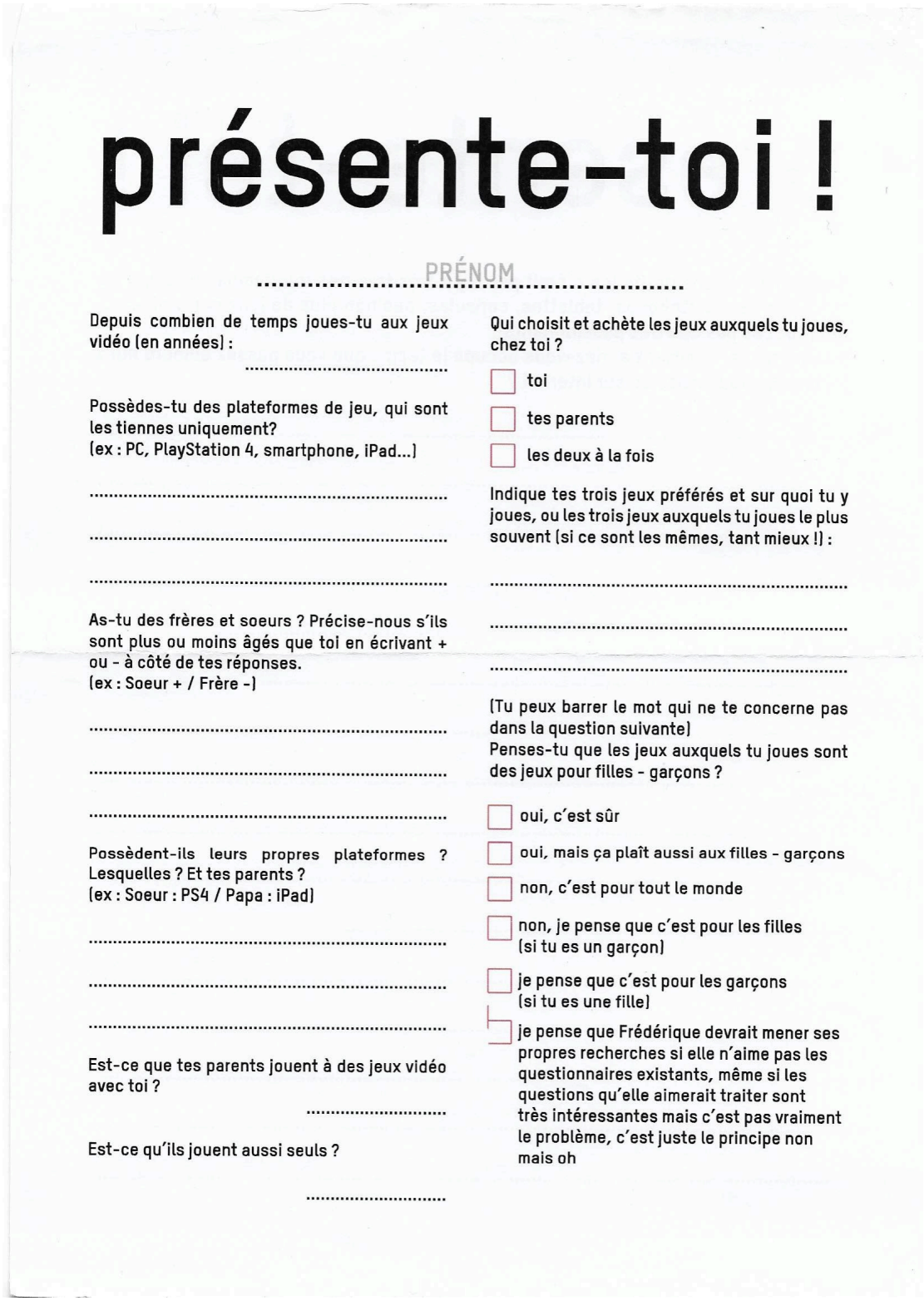
9.5.3 Questionaire design from session 3 – Jan.-June 2015

9.5.3.1 Front



présente-toi !

PRÉNOM .....

Depuis combien de temps joues-tu aux jeux vidéo (en années) :

.....

Possèdes-tu des plateformes de jeu, qui sont les tiennes uniquement?
(ex : PC, PlayStation 4, smartphone, iPad...)

.....

.....

.....

As-tu des frères et soeurs ? Précise-nous s'ils sont plus ou moins âgés que toi en écrivant + ou - à côté de tes réponses.
(ex : Soeur + / Frère -)

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.....

.....

Possèdent-ils leurs propres plateformes ? Lesquelles ? Et tes parents ?
(ex : Soeur : PS4 / Papa : iPad)

.....

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.....

Est-ce que tes parents jouent à des jeux vidéo avec toi ?

.....

Est-ce qu'ils jouent aussi seuls ?

.....

Qui choisit et achète les jeux auxquels tu joues, chez toi ?

- ☐ toi
- ☐ tes parents
- ☐ les deux à la fois

Indique tes trois jeux préférés et sur quoi tu y joues, ou les trois jeux auxquels tu joues le plus souvent (si ce sont les mêmes, tant mieux !) :

.....

.....

.....

(Tu peux barrer le mot qui ne te concerne pas dans la question suivante)
Penses-tu que les jeux auxquels tu joues sont des jeux pour filles - garçons ?

- ☐ oui, c'est sûr
- ☐ oui, mais ça plaît aussi aux filles - garçons
- ☐ non, c'est pour tout le monde
- ☐ non, je pense que c'est pour les filles (si tu es un garçon)
- ☐ je pense que c'est pour les garçons (si tu es une fille)
- ☐ je pense que Frédérique devrait mener ses propres recherches si elle n'aime pas les questionnaires existants, même si les questions qu'elle aimerait traiter sont très intéressantes mais c'est pas vraiment le problème, c'est juste le principe non mais oh

9.5.3.2 Back

présente-toi !

Quand nous étions petits (ce n'était pas il y a très très très longtemps, merci), il n'y avait pas de smartphones, tablettes, consoles, pas non plus de jeux sur ordinateur (en tout cas pas des très passionnants).
À notre place, comment auriez-vous occupé le temps que vous passez aujourd'hui à jouer à des jeux vidéo ou sur internet ?

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10. Le genre, le design, et la technologie à travers les jeux vidéos pour enfants (Traduction)

10.1 Introduction : Trouble technologique féminin

Les femmes ont eu une relation conflictuelle avec la technologie depuis les premières machines à coudre mécanisées qui sont entrées dans les maisons au milieu du 19e siècle. Comme la mécanisation prétendait libérer le temps des femmes d'un travail pénible, l'élévation des normes de propreté a comblé le vide créé par les nouveaux dispositifs "économiseurs de travail." (Forty 1986, 94-119). Cependant, les femmes n'avaient toujours pas plus de temps libre. Les concepteurs masculins et les ingénieurs d'appareils ménagers étaient maintenant confrontés à un nouvel utilisateur final : les femmes au foyer et les femmes domestiques. Ces nouvelles consommatrices - jugées simples d'esprit et faibles par rapport aux hommes - ont été considérées comme étant les moins capables des utilisateurs finaux. Les femmes sont rapidement devenues les symboles de la convivialité d'un design. Après tout, si une femme pouvait s'en servir, n'importe qui le pourrait.

(Fig 1.1 1900 Kodak Brownie appareil photo & 1960 Mini magazine publicités britannique © Advertising Archives)

Paola Tabet, chercheuse en études féministes sur la technologie, soutient que le contrôle par les hommes de la production de la technologie, des outils et des armes, a été la clé de la domination masculine et du patriarcat depuis les cultures de chasseurs et de cueilleurs. Cynthia Cockburn ajouterait que les hommes ont continuellement réaffirmé et réorganisé les industries pour protéger et maintenir le

contrôle masculin des positions clés d'une l'industrie à chaque mutation technologique, et que la culture masculine de l'ingénierie, par exemple le four à micro-ondes, continue de façonner les expériences domestiques des femmes, y compris par la cuisine du repas familial. J.C. Kaufmann a noté que la maîtrise masculine de la technologie domestique (c.-à-d. outils électriques ou tondeuses à gazon) est valorisée tandis que la maîtrise féminine de la technologie domestique (c.-à-d. lave linge séchant ou fours programmables) est considérée comme insignifiante et subalterne.

Les exemples abondent de conceptions sexistes problématiques qui découlent de la culture d'ingénierie masculine vers une population beaucoup plus hétérogène. Par exemple, les premiers airbags étaient conçus pour une norme biomorphique masculine adulte et ont tué des femmes de petite taille et des enfants. iOSHealthkit 8 de Apple - qui devait être une "application complète de suivi de la santé" - n'a pas considéré le suivi reproductif des femmes (menstruation et fécondité) comme assez important pour l'inclure dans sa première version, bien que le nombre de pas sur une journée et les taux d'alcoolémie puissent être suivis. Nous pouvons questionner l'homogénéité de la culture qui crée des applications d'intelligence artificielle qui au départ n'ont pas pu répondre aux voix féminines aiguës, ou aux accents étrangers, ou ont répondu à des crises telles que le viol ou la violence avec des blagues ou du sarcasme. Les applications de photographie qui n'ont pas été capables d'identifier correctement des individus à peau foncée ou qui les ont étiquetés comme primates via les IA, ne sont que quelques-uns des échecs de conception hautement publicisés

qui résultent de la monoculture masculine blanche de Silicon Valley et de sa myopie sélective.

(Fig 1.2 Genre et diversité des postes de direction dans les entreprises GAFA. 2014. Gigaom/Bill Carson)

Cette thèse se concentre sur une technologie de type très spécifique - les jeux vidéo, produits de la culture de l'ingénierie masculine - et le lien étroit de genre entre ceux qui fabriquent les jeux vidéo (Production) et ceux qui en jouent (Réception). Nous allons nous concentrer sur un secteur de l'industrie du jeu vidéo consacré aux pré-adolescentes, qui était il y a 20 ans le site de l'entreprenariat féministe dans l'espoir de remédier au déséquilibre entre les sexes dans les TIC. Nous allons explorer les raisons de cet échec.

10.1.1 La quête féminine solitaire de la technologie

En 1988, j'ai mis la main sur un programme d'animation 3D primitif dans mon cursus de design industriel, et je me suis éprise des possibilités offertes par les ordinateurs. J'ai exploré avec enthousiasme l'Internet naissant, les premiers navigateurs Web, les langages de script et les dimensions sociales de plus en plus puissantes du Web : dans les chat-rooms, et, plus tard, dans les sites de réseaux sociaux. Je n'avais pas d'amis qui partageaient ma technophilie - c'était une activité solitaire, mais je savais qu'il y avait une communauté grandissante d'âmes aux intérêts similaires que je pourrais rejoindre si seulement j'avais assez d'intelligence, d'ambition et de détermination. Je ne voulais pas seulement utiliser la technologie ; je voulais comprendre comment elle fonctionnait, afin de pouvoir concevoir de nouvelles technologies.

Je suis entrée dans l'industrie des technologies de l'information et de la communication (TIC) par une porte latérale, et je n'ai jamais regardé en arrière. Ayant travaillé dans le développement de nouveaux médias, de jeux et de logiciels pendant près de 20 ans, la disparité entre les sexes que j'ai rencontrée dans toutes les entreprises a toujours été extrême. Bien que je ne me sois jamais posée cette question dans mes quinze premières années en TIC, dans un moment de doute, j'ai commencé à me demander pourquoi y a-t-il si peu de femmes ? (Figure 1.3)

(Figure 1.3 Répartition par sexe de la main-d'œuvre de développement de jeux vidéo, 2005. IGDA)

Après tout, le travail est créatif, amusant, intéressant, stimulant et relativement bien rémunéré. Les tâches de production sont très diverses et exigent des compétences très différentes - aptitudes sociales et de communication pour le travail d'équipe, logique, esprit d'analyse, rigueur et attention aux détails - et pas seulement des compétences en mathématiques pour la programmation. La programmation n'est qu'une partie du processus de production, un processus critique, mais en aucun cas le seul type d'emploi. Le travail d'équipe est un aspect crucial et souvent sous-estimé du travail. Aucune force physique ou endurance particulière n'est requise, et les lieux de travail sont généralement des bureaux intérieurs relativement propres et confortables. Le fruit de notre travail sert à divertir et à éduquer les gens. Ces descriptions d'emploi semblent toutes favorables aux femmes, alors pourquoi y a-t-il une telle disparité entre les sexes dans les TIC ?

Bien que cette question semble naïve aux gens à qui je m'adresse - comme si je remettais en question un état d'être évident ou naturel - on me dit souvent que les femmes ne s'intéressent pas à la technologie. Les femmes ne jouent pas aux jeux

vidéo. Les femmes n'aiment pas les maths. Les femmes ne peuvent-elles pas laisser la dernière tour d'ivoire des mâles introvertis tranquilles (un peu comme un refuge pour faune en voie de disparition) ? Les enjeux sont cependant trop élevés dans un monde où les métiers de l'ingénierie et de la technologie occupent une part de plus en plus importante de l'économie mondiale, du prestige financier et du pouvoir pour que la moitié de la population reste à l'extérieur.

J'ai donc décidé d'explorer le lien entre le genre, la technologie et le design à travers l'artefact des jeux vidéo pour filles. En tant qu'artefact, les jeux de filles étaient autrefois une lueur d'espoir dans les stratégies féministes pour combler le fossé entre les sexes dans l'utilisation de l'ordinateur ; ils permettraient aux filles de rattraper les garçons dans une progression naturelle vers l'éducation technologique, et les professions des TIC s'ensuivraient. Ce scénario ne s'est pas tout à fait déroulé comme souhaité. Si le fossé entre les sexes n'existe peut-être plus dans l'utilisation des ordinateurs, l'ambition d'une plus grande participation des femmes en production informatique n'a pas suivi. Comme nous le verrons au chapitre 2, les pourcentages de femmes ont chuté dans l'enseignement et la production des TIC depuis le sommet atteint par les femmes en 1985, lorsque les femmes ont obtenu 35,8 % des diplômes en informatique (aux U.S.). Comment est-ce possible? Les statistiques de 2012-2013 montrent que les femmes n'obtiennent plus que 14,5% des diplômes en informatique (aux U.S.).

(Figure 1.4 Statistiques sur le genre et la diversité pour les diplômes américains en informatique, 2012-2013 © Gigaom)

Si nous supposons que mes questions sont légitimes, nous découvrons rapidement une situation de "poule et d'œuf". Moins de femmes s'engagent dans les voies

traditionnelles d'accès à la profession (voir Chpt. 2, Figure 2.2), et les taux de rétention sont faibles pour celles qui le font. Cet état de fait a donné lieu à de nombreuses études exhaustives sur les causes possibles et à des recommandations pour combler cette "fracture numérique" ou de "pipeline qui fuit". Isabelle Collet (2005) a trouvé un contrepoint intéressant : si le nombre de femmes françaises étudiant l'informatique est resté le même, leur nombre a été éclipsé par l'afflux toujours plus important d'étudiants de sexe masculin.

Les féministes libérales se concentrent sur l'égalité des droits, des chances et des salaires pour les femmes et les filles ; dans les pays libéraux, le féminisme libéral est considéré comme la norme. Alors que ma thèse a commencé avec une position féministe libérale pour ma revue de littérature (chapitre 2), la monoculture masculine est considérée par ces féministes comme un état naturel auquel les "Autres" (femmes, minorités ethniques, LGTBQIA, etc.) doivent s'adapter. Dans ma conclusion, j'expliquerai pourquoi c'est une façon limitée de voir le problème, comme "réarranger les transats sur le Titanic" pour utiliser un cliché.

Alors que les femmes font des progrès dans la plupart des disciplines, les croyances en la supériorité intellectuelle masculine et l'incompétence technologique féminine sont renforcées par la littérature et la culture populaires. Les dichotomies essentialistes sont toujours présentées comme des raisons valables pour expliquer le manque de femmes dans les disciplines technologiques, et les jouets et les jeux fournis à nos enfants en témoignent. Jeux de filles ? Coiffure, mode, petits amis et animaux de compagnie.... Jeux de garçons ? Jeux de tir, conduite, sports et jeux de guerre.... Les jeux de genre réifient d'autres stéréotypes de genre à travers leurs

catégories, sujets, gameplay et esthétique. En séparant un groupe d'utilisateurs - les filles - comme ayant besoin d'une approche particulière à la technologie, son association avec la masculinité est renforcée.

Les jeux de filles peuvent-ils aider à recruter plus de femmes pour la production des TIC comme les jeux vidéo ont motivé presque tous mes collègues masculins à opter pour une carrière dans la technologie ? En bref, la réponse est non. Utilisant une épistémologie sémiotique pragmatique, ma thèse utilise des artefacts conçus - des jeux vidéo pour les filles - pour explorer et discuter du rôle des stéréotypes sexuels et technologiques comme habitudes de croyance qui aident à maintenir la domination masculine dans les TIC. Ces habitudes de croyance sont le principal obstacle à la diversité des genres - limitant le nombre de femmes désireuses de transgresser les normes de genre dans les professions masculines d'une part, et créant une prophétie auto-réalisatrice par la socialisation du genre des parents qui réifie la croyance en la passion et les compétences technologiques masculines tout en développant un accès technologique inégalitaire et en encourageant leurs filles pour les genres.

Les stéréotypes sont des images culturellement co-construites et réductrices qui tirent leur stabilité de leur répétition. Ils allègent considérablement notre charge de travail cognitif grâce à des processus décisionnels automatisés dont nous ne doutons pas. Les stéréotypes de genre et de technologie sur lesquels nous nous concentrerons dans cette thèse peuvent être classés comme une dichotomie : stéréotypes de l'incompétence technologique des femmes, découlant de faiblesses hypothétiques en mathématiques, en sciences et en cognition d'une part, et de l'hyper-compétence

technologique des hommes dans les stéréotypes des scientifiques, hackers, geeks et gamers, d'autre part.

10.1.2 Mouvement pour les jeux de filles

L'une des premières tentatives concrètes pour corriger le fossé technologique entre les sexes s'est produite dans les années 1990 : le mouvement Girl Games. Après le succès phénoménal de *Barbie Fashion Designer*, qui n'était pas un jeu, le mouvement des jeux de filles a cherché à accroître l'intérêt des filles pour la technologie numérique par le biais de jeux vidéo conçus pour le marché féminin alors inexistant. L'amusement, le plaisir et le jeu permettraient aux filles de rattraper les garçons sur le plan technologique. Les femmes entrepreneurs ont fondé des sociétés comme Her Interactive et Purple Moon pour produire une série de jeux comme les séries *Rockett* et *Nancy Drew* afin d'atteindre le marché féminin, en particulier les préadolescentes et les adolescentes. Ce mouvement espérait et supposait que le gameplay technologique des filles serait une passerelle naturelle vers une participation accrue des femmes dans la production des TIC. (Cassel & Jenkins, 1998) Le féminisme a dû faire face aux réalités désordonnées de la lutte pour l'espace des étagères des magasins de jouets, et plusieurs de ces premiers titres se concentraient sur des jeux de rôle narratifs qui étaient parfois critiqués pour leur manque d'ambition féministe. La compétence technologique était le produit dérivé des jeux de filles, ce qui a permis aux filles de se familiariser avec le matériel informatique, les logiciels et les périphériques.

Près de 20 ans se sont écoulés depuis la naissance du mouvement, et après que Mattel ait racheté et décimé toute concurrence à Barbie, les jeux de filles sont passés

d'un mouvement féministe idéaliste à un mouvement synonyme de mode, de maquillage, de shopping et de jeux de soins qui ne semblent pas aller au-delà de la création de consommateurs féminins et du renforcement des stéréotypes de genre, encourageant les filles à prendre l'habitude d'être objectivées par une attention constante à leur apparence et d'obtenir la satisfaction personnelle de s'occuper des autres.

Les jeux vidéo peuvent être une force pour encourager les filles à explorer plutôt que de suivre des chemins prescrits, à remettre en question les stéréotypes, à développer leur intérêt pour la façon dont les choses fonctionnent, et à accroitre l'estime de soi et la persévérance. Cependant, il n'est pas nécessaire de recourir à une technologie spécialement circonscrite, chargée d'autres stéréotypes de genre comme le sujet, le gameplay et/ou l'esthétique qui renforcent la norme masculine "sérieuse" de la technologie en renforçant accidentellement les intérêts banals ou superficiels des filles. Les jeux de filles mettent l'accent sur le statut de "l'Autre" des filles. La clé réside peut-être dans ce qui est actuellement produit sur le marché du jeu vidéo indépendant, moins préoccupé par les agendas politiques que de pousser l'esthétique et le gameplay au-delà des genres traditionnels et de créer des expériences originales et puissantes grâce à la technologie pour les garçons et les filles, et pour les hommes et les femmes. Ces questions seront abordées au chapitre 6.

Les jeux sont-ils suffisants pour accroître la participation des femmes à la production de logiciels ? Probablement pas. Cependant, les jeux vidéo s'attaquent au problème là où il commence. Si les préadolescentes et les adolescentes ne peuvent développer une affinité pour la technologie, une masse critique ne s'accumulera pas pour

remettre en question et changer les pratiques immatures d'une industrie relativement jeune par rapport aux professions audiovisuelles un peu plus matures comme l'industrie du cinéma ou de la télévision. Évidemment, les jeux ne sont pas la seule voie vers la production des TIC ; personnellement, les premiers réseaux sociaux sur Internet m'ont beaucoup plus attirée que les jeux vidéo. Le chapitre 5 - sur les femmes dans le développement de jeux vidéo et leur contextes domestiques - a mis en évidence un manque surprenant de jeux vidéo comme jouets préférés qui ont motivé ces informaticiennes accomplies à d'entrer dans le domaine du développement de jeux vidéo, mais cela peut être générationnel.

Les jeux se sont avérés avoir des qualités souhaitables sur nos capacités cognitives (Green &Bavelier 2003, 2007, 2011, 2012, 2017) et sur notre santé mentale (McGonical 2011). Le pouvoir d'un jeu réside dans ses effets subconscients par le plaisir et la satisfaction, un sentiment de contrôle et un sentiment de défi, d'accomplissement et de fierté. Ce sont des motivations intrinsèques importantes et peuvent, dans les bonnes circonstances, encourager un enfant à envisager une carrière dans les TIC plus tard. Cependant, je dirais que les jeux que nous mettons entre les mains des enfants n'apportent pas nécessairement ces qualités positives en quantités égales. Les parents devraient être conscients de ce à quoi leurs enfants jouent et s'efforcer d'être aussi actifs et impliqués dans la sélection, l'achat et le jeu vidéo pour leurs filles qu'ils semblent l'être pour leurs fils, selon les conclusions du chapitre 6.

10.1.3 Structure de la thèse

Le chapitre 2 sert d'introduction aux termes et aux questions sur lesquels repose cette recherche. Une longue auto-ethnographie commence ce chapitre pour établir ma position de chercheur. Mon expérience en technologie et en design résume toutes les façons dont le genre s'affirme au cours d'une vie : de mon premier milieu domestique avec deux parents scientifiques ; à la négociation de mon éducation avec des rencontres technologiques hésitantes qui se sont transformées en technophilie solitaire ; à mon évolution professionnelle dans le milieu universitaire et le développement de logiciels où j'ai rencontré pour la première fois le phénomène de l'Imposteur ; et à l'analyse finale de mon milieu domestique actuel avec les habitudes de jeu vidéo de ma famille, en particulier celles de mes deux enfants, une fille et un garçon, qui soulignent comment la légitimité et l'appartenance entrent en jeu. J'explique ensuite les termes et les enjeux des domaines de recherche qui englobent le genre, le design et la technologie.

D'une importance particulière dans le chapitre 2, la sémiotique pragmatique du scientifique et philosophe américain C.S. Peirce (1839-1914) fournit les cycles de prise d'habitude qui expliquent comment les croyances en stéréotypes de genre sont utilisées pour donner un sens à notre milieu et influencer nos actions, généralement dans des processus rapides, automatisés et subconscients. Cette fabrication de sens est appelée sémiose et peut se produire à trois niveaux : la micro-sémiose où les stéréotypes de genre peuvent être sollicités comme interprétant dans un signe, la méso-sémiose dans laquelle la fabrication de sens se produit à travers un réseau de signes - comme le concept de capital culturel ou de capital joueur - et la macro-

sémiose qui forme des idéologies de genre culturellement co-construites qui sont renforcées par des normes sociales qui dictent des professions, comportements, vêtements, émotions et intérêts appropriés pour les hommes et les femmes avec une croyance en une dichotomie stricte du sexe et du genre.

Le design entre en jeu à travers l'artefact des jeux vidéo pour filles qui renforcent les idéologies de genre. Les jeux vidéo pour filles dans cette thèse incluent non seulement les jeux "féministes" des années 1990, mais aussi les jeux consuméristes comme ceux que l'on trouve sur les sites barbie.com, girlgames.com, ou girlsgogames. Alors que le rose et les couleurs pastel peuvent ou non être l'esthétique dominante dans les jeux de filles, ce qui différencie les jeux "roses" discutés au chapitre 2 des jeux vidéo artistiques et indépendants non-genré discutés au chapitre 6 est la dépendance des jeux de filles sur l'essentialisme de genre pour des sujets qui renforcent les rôles stéréotypés des femmes en matière d'auto-objectivation, de socialisation et de prise en charge des autres. Les jeux neutres ou non-sexiste utilisent des positions neutres sur des sujets qui ne sont pas fondées sur des stéréotypes de genre, ouvrant la possibilité d'expériences universelles partagées, et ils repoussent les limites expérimentales du gameplay au-delà des préférences stéréotypées du genre tel que pointer-cliquer pour les filles et d’action-réflexe-rapide pour les garçons.

Dans les chapitres 4 à 6, nous explorerons comment ces stéréotypes liés au genre et à la technologie se manifestent dans la production et la réception du modèle de réseau des parties prenantes (Darras & Belkhamsa, 2016) afin de définir continuellement la technologie comme une monoculture masculine à laquelle les "Autres" (femmes,

LGBTQ, minorités ethniques, etc.) doivent s'adapter mais ne peuvent jamais être une partie naturelle. Le milieu masculin des TIC n'est ni naturel ni neutre ; ces croyances réifient plutôt le contrôle masculin de la technologie et l'accès aux positions les plus prestigieuses et stratégiques des TIC.

Le chapitre 3 est la revue de la littérature des publications utilisées pour ma thèse et intéressera les chercheurs travaillant dans des domaines similaires ou vers des objectifs similaires. Ceux qui veulent simplement suivre mon programme de recherche peuvent sauter ce chapitre. Ma méthodologie de revue de littérature commence par des recherches par mots-clés, un codage de « A » à « C » de ma bibliographie par proximité de mon sujet de recherche - avec les publications "A" contenant au moins 3 mots-clés - et s'étend à une méta-analyse quantitative et qualitative de ma bibliographie, avec un accent particulier sur les publications "A." Ma carte conceptuelle explique comment les recherches les plus pertinentes sur le genre et les jeux vidéo s'articulent selon les différents thèmes du modèle du réseau des parties prenantes. Le chapitre se termine par une analyse géographique des chercheurs et des réseaux de "Publications A".

Mon processus de recherche est constructiviste et a été exécuté en trois phases. Les deux premiers (chapitres 4 et 5) se concentrent sur les femmes dans le développement de jeux, et la dernière phase (chapitre 6) se concentre sur les enfants parisiens âgés de 9 à 11 ans jouant dans un atelier de jeux vidéo après l'école. Par conséquent, chaque chapitre expliquera l'idée initiale qui mène à une hypothèse ; le choix de la méthodologie ; les avantages, les limites et les contraintes de la méthodologie ; les résultats ; et une discussion des questions soulevées ou auxquelles

on a répondu au cours de cette phase de recherche. Je ne crois pas à la neutralité du chercheur et, par conséquent, j'inclus les problèmes que j'ai rencontrés et qui rendent les données ou les résultats problématiques, en particulier au chapitre 5. En tant que chercheuse féministe, je me méfie des chercheurs qui ne reconnaissent pas ouvertement leurs préjugés ou leurs positions de sujet, et qui se posent en observateurs neutres tout en essayant de confirmer à tout prix la supériorité technique ou scientifique masculine. Une fois qu'on vous a appris à examiner les croyances et les valeurs des chercheurs et à examiner leur méthodologie, les processus de sélection des sujets, les hypothèses et les conclusions teintées idéologiquement, il est difficile de revenir à des postures scientifiques héroïques.

Le chapitre 4 examine les préférences de personnalité des femmes dans le développement de jeux. Cette phase a commencé lors de ma revue de littérature sur les problèmes de "pipeline" qui semblaient ignorer que peut-être toutes les femmes n'étaient pas taillées pour le travail dans les TIC. Les femmes que j'ai connues grâce à ma carrière de productrice de logiciels étaient des iconoclastes fortes et rationnelles. Je n'avais pas encore plongé dans le trou du lapin, comme *Alice au Pays des Merveilles,* de la recherche évolutionnaire et biologiquement déterministe, mais j'ai découvert ses méthodes peu convaincantes et biaisées. Peut-être que les personnalités des femmes des TIC étaient "différentes" ? J'ai utilisé le Myers Briggs Type Inventory (MBTI) - un instrument controversé - parce que ses 16 catégories sont omniprésentes dans le conseil éducatif et le placement professionnel, et pour pouvoir comparer mes résultats avec d'autres bases de données publiées. Mes conclusions ne m'ont pas déçue, mais la clé de la résilience des femmes dans les TIC ne réside pas

dans leur rationalité détachée (en fait, il y avait beaucoup plus de préférences Sentiments (Feeling) que de préférences Pensée (Thinking)), mais surtout dans leur résistance aux règles, normes et stéréotypes (une forte préférence pour iNtuition par rapport à Sensing). Plus important encore, 47 % de mes 94 femmes auto-déclarées étaient de type INFJ et INTJ qui comprend moins de 4 % de lycéennes. L'autre conclusion importante est que les hommes dans le développement de jeux ont des préférences de personnalité plus hétérogènes, en particulier parce qu'ils croient en des règles, des normes et des stéréotypes et croient en leur place légitime dans l'industrie des TIC, qui a aussi besoin d'un travail de production moins créatif basé sur des règles. Cette recherche a renforcé l'importance des croyances, ou plus spécifiquement des doutes des femmes dans les règles, les normes et les stéréotypes.

Le chapitre 5 se concentre sur l'orientation des rôles sexuels des femmes dans le développement des jeux, d'après mon étude MBTI. Le BemSexRoleInventory (BSRI) est un instrument de mesure de l'alignement du concept de soi et de la position du sujet sur les stéréotypes de genre. En fin de compte, en utilisant la même méthode pour obtenir des participants, je n'ai eu que 14 participants après quatre semaines, et j'explique plus en détail pourquoi le recrutement de sujets a pu être si décevant. L'explication succincte est que l'orientation de rôles genrés pour les femmes techniques est un sujet sensible et difficile qui chevauche des systèmes de valeurs opposés où la féminité et la compétence scientifique/technique sont en conflit direct. Les discussions de suivi que nous avons eues autour de la sphère domestique de l'enfance de ces femmes et de leurs motivations pour entrer dans les TIC ont montré des points communs précieux comme le soutien d'un parent, les mères qui travaillent

et l'importance des tâches pratiques dans l'enfance. Quelques-unes venaient de familles traditionnelles très conservatrices et sont entrées sur le terrain par une rébellion motivée.

Le chapitre 6 passe à l'observation des enfants dans un atelier après l'école au centre culturel Gaité Lyrique dont le centre de jeux vidéo est spécialisé dans les jeux indépendants et artistiques. Cooper et Weaver (2003) expliquent comment la performance publique des compétences informatiques produit de l'anxiété et crée une réduction de la performance des membres du groupe défavorisé par le biais de la menace de stéréotype (Steele et Anderson 1995). La conception ouverte du centre, avec ses murs de verre, pourrait certainement conduire à cette augmentation de l'anxiété des femmes ; cependant, ce phénomène était présent chez les débutants, quel que soit leur sexe, et non seulement chez les filles.

Mon étude ethnographique a utilisé la technique de l'observateur connu mais discret, et a commencé par un questionnaire dont les résultats se sont révélés beaucoup plus intrigants que les observations de jeu des enfants, éclairant l'influence centrale des stéréotypes de genre des parents sur leurs enfants. Ce résultat montre le gain, 20 ans plus tard, de la parité relative entre les sexes dans la consommation des médias des TIC. Tous les enfants participants à l'âge de 9 ans avaient au moins joué sur le téléphone tactile d'un parent et avaient été initiés à l'informatique à l'école. Les enfants ayant des frères et sœurs plus âgés ont beaucoup plus tôt accès à la technologie des jeux vidéo que les premiers nés.

La principale conclusion à retenir était la différence entre les sexes en ce qui concerne l'implication des parents. Selon les déclarations des enfants, les parents étaient plus

impliqués dans la sélection des jeux et l'achat de jeux vidéo pour les garçons (59%) que pour les filles (25%) ; les budgets des jeux vidéo des garçons étaient plus fortement subventionnés par les parents que pour les filles. Les filles avaient accès à moins de technologie que leurs camarades de classe masculins, souvent sur des appareils à écran tactile partagé avec d'autres membres de leur famille ; à une variété plus étroite de jeux qui étaient souvent peu coûteux ou des jeux gratuits ; et ont été initiés à la technologie plus tard dans l'enfance, et avaient plus de contrôle parental sur les limites d'écran pour les fins de semaine seulement. Selon les déclarations des enfants, les parents parisiens, même les parents qui jouent eux-mêmes aux jeux vidéo, ne semblent pas considérer les jeux vidéo comme une activité nécessaire ou bénéfique pour leurs filles et n'étaient généralement pas impliqués dans un processus de sélection de jeux pour elles, ce qui a pour conséquence que la liste des titres de jeux préférés des filles est étroite et peu reluisante. Ces filles négligées doivent faire beaucoup plus d'efforts pour trouver des jeux valables et négocier leur achat - sans un réseau actif de pairs avec qui partager l'information, à moins qu'elles ne s'engagent dans un jeu transgressif de genre en tant que " garçons manqués ". Ces filles ont peut-être eu accès à la technologie, mais pas à la même qualité d'accès technologique que les garçons. Je présente également deux études de cas extrêmes: les filles passionnées qui réussissent à se tailler une expertise significative en tant que plus jeunes enfants de familles nombreuses et le garçon désintéressé qui avait accès à une console dans son salon mais qui ne s'intéressait pas aux jeux vidéo. Ces deux études de cas portent sur les transgressions de genre et leurs stigmates sociaux.

Enfin, au chapitre 7, la conclusion traite de l'importance du doute - encourager le changement en s'attaquant aux incohérences et aux manipulations de la monoculture masculine des TIC sur de multiples fronts ; cependant, trop de doute pourrait être contre-productif. Les croyances et les habitudes sont des éléments stables destinés à alléger le traitement cognitif et sont très résistants au changement. Changer les croyances culturelles est un long et ardu processus socialement co-construit qui exige de la vigilance, de la pédagogie, de la patience et de la persévérance. La théorie de la culture pourrait fournir un modèle pour accélérer le cycle de prise de nouvelles habitudes. Après avoir plaidé en faveur d'une technologie non sexiste, le chapitre se termine par une heuristique pour concevoir des expériences numériques d'enfants non sexistes.

10.2 Conclusion : Doute et crise

Les nombreux ingrédients mis de l'avant dans cette enquête sont compliqués à assembler dans un puzzle cohérent, comme essayer de mélanger du brocoli dans une recette de dessert. Les jeux sont le dessert ; les valeurs féministes sont le brocoli - bon pour tout le monde, mais difficile à avaler pour certains. Un ingrédient important qui continuera d'émerger de la sémiotique pragmatique est le doute en tant que facteur de crise, initiateur de recherche, et facilitateur de changement.

En nous concentrant sur la réception et la production des jeux vidéo, nous pouvons commencer à comprendre comment certains des éléments les moins évidents du débat sur le genre et le jeu vidéo se manifestent dans nos idéologies de genre et macro-sémioses culturellement construites.

Les jeux vidéo peuvent aider à l'acquisition de compétences technologiques, ce qui en soi peut justifier ou encourager quelqu'un à se lancer dans le domaine des TIC par le biais d'expériences de jeux vidéo agréables. Cependant, les jeux de filles en eux-mêmes n'ont pas réussi à faire participer les filles et les femmes à la conception, au développement et à la production de jeux vidéo. Comme nous l'avons vu au chapitre 5, seule une poignée de femmes passionnées et résilientes travaillant actuellement sur le terrain ont même mentionné les jeux vidéo dans leur liste de jouets préférés d’enfance ou comme influences ou motivateurs de carrière.

10.2.1 Doute parental

Au chapitre 6, nous avons vu comment les parents parisiens perpétuent la croyance que la technologie est une discipline masculine par leurs actions, l'attention parentale et les investissements financiers. Selon les auto-déclarations des enfants, les parents des garçons investissent davantage dans l'achat d'équipement et les titres de jeux vidéo payants, fournissent plus de recommandations pour la sélection de jeux d'un enfant mâle, et jouent plus de jeux vidéo avec les enfants mâles. Ce résultat mérite d'être exploré plus en détail en se concentrant davantage sur les différences entre les sexes dans les dépenses, l'attention parentale et l'accès aux jeux vidéo - dans les études quantitatives et dans d'autres milieux. Harvey (2016) et d'autres comprennent la difficulté des études ethnographiques sur les jeux vidéo dans le contexte domestique, mais comme mes recherches n'incluaient pas les parents des enfants, nous devons nous fier à la perception qu'ont les enfants de leur accès technologique, de leur politique domestique de contrôle parental, de leur expérience de jeu et de leur plaisir.

Sans l'encouragement actif de leurs parents, nous avons vu comment deux joueuses passionnées de milieux très différents ont pu profiter de l'inattention parentale en tant que benjamines de familles nombreuses ayant accès à une grande variété de titres de jeux - pour développer un véritable capital technologique de "gamer." Alors que je voyais des filles passionnément engagées dans le gameplay de titres créatifs indépendants, ces filles avaient rarement accès à la technologie au-delà des consoles portables et des écrans tactiles partagés. Les filles avaient plus de limites de temps à l'écran pour jouer seulement en fin de semaine. Les titres pour filles étaient pour la

plupart des jeux libres ou des titres évidents de Nintendo qui incitent rarement à des comportements addictifs, et les filles ont donc cessé de jouer sans intervention parentale, réitérant ainsi la croyance des parents que "les filles ne sont tout simplement pas intéressées par les jeux vidéo". Il est triste de constater que la seule façon pour les filles d'avoir la liberté d'utiliser la technologie sur un pied d'égalité avec les garçons était de tirer le meilleur parti possible de l'accès à la technologie et du temps non supervisé fourni par le chaos domestique relatif d'une grande famille.

La croyance des parents dans l'inadaptation de la technologie pour leurs filles continue de désavantager les filles, qui accumuleront de nombreux autres indices sociaux qui leur feront douter de plus en plus de leurs capacités en matière de STIM. Pourquoi aller dans un domaine si vous ne croyez pas que vous allez réussir ?

10.2.2 Doute en matière de TIC

Certaines chercheuses comme Wachter-Boettcher (2017) et Cockburn (1983, 1988, 1991 et 1993) doutent de la sincérité de la direction des TIC à vouloir vraiment accroître la diversité de ses équipes de conception et de production. Wachter-Boettcher croit que les initiatives "bidon" des TIC en matière de diversité permettent aux intérêts capitalistes néolibéraux de maintenir le secteur technologique aussi déréglementé que possible en cultivant une monoculture qui réduit au silence la critique et la dissidence. Cockburn soutient que le contrôle technologique masculin se réorganise et se réaffirme pour détourner et résister au changement féministe dans les secteurs technologiques : en créant des environnements de production masculins, en redéfinissant les qualifications par la représentation syndicale du travail masculin et en créant des normes définies par les hommes blancs auxquelles tous les autres

(femmes, minorités ethniques, personnes handicapées, homosexuels, etc.) doivent se plier. Les arguments de Wachter-Boettcher et de Cockburn sont très convaincants et permettent aux féministes de comprendre qu'attendre poliment dans les coulisses qu'un espace leur soit réservé dans la production des TIC ne se fera pas sans une réaction violente des hommes craignant la perte de leur privilège masculin. Les hommes qui craignent que leur médiocrité soit dévoilée dans des conditions vraiment équitables, mènent à une crise, et à la perte de leur statut social dans un ordre néo-libéral brutal.

Comme nous l'avons vu au chapitre 4 - et dans les recherches d'Isabelle Collet - un flot constant de femmes technophiles n'hésitent pas à remettre en cause et à braver les normes culturelles pour s'engager dans des professions technologiques. Ce qui différencie ces femmes, ce sont leurs préférences personnelles rebelles et leurs choix en rupture par rapport aux règles, conventions et normes. La plupart de ces femmes se retrouveraient probablement dans les TIC indépendamment des jeux de filles en raison de leur appréciation de la science et de la technologie. Cependant, ce pourcentage de femmes continue d'être éclipsé par le nombre croissant d'hommes entrant dans ces domaines prestigieux, lucratifs et prospères.

10.2.3 Doute dans sur jeux de filles

Les jeux de filles, surtout dans leurs manifestations actuelles, créent des consommatrices numériques, et non des productrices numériques. Si nous sommes honnêtes au sujet de la création de consommatrices de technologies et d'utilisatrices d'outils technologiques - comme les productrices de médias sociaux qui travaillent habituellement gratuitement et créent une grande richesse pour les entreprises de

médias sociaux par l'accumulation de données et de revenus publicitaires - alors nous pouvons dire, "mission accomplie."

Les jeux de filles se sont éloignés des débuts idéalistes des entrepreneuses féministes. Ils sont devenus de purs produits de marketing, moins pour développer les compétences techniques et le confort que pour renforcer les marques de jouets ou créer des revenus publicitaires. Ces premières entrepreneuses féministes, comme Brenda Laurel, avaient la difficile tâche de rendre leur idéologie humaniste commercialement viable dans un marché pratiquement inexistant. Les produits devaient trouver rapidement un public afin de garder de l'espace sur les étagères des magasins, et elles étaient donc obligées "de rencontrer les filles là où elles se trouvaient" si elles voulaient survivre commercialement. Nous ne pouvons que regretter l'ambition bienveillante des pionnières féministes.

Les jeux vidéo destinés aux filles circonscrivent un domaine d'activité pour les filles qui est créativement limitant. Les jeux de filles renforcent par subrepticement le statut des femmes dans STIM en tant qu'Autre, et se démarquent de la norme masculine. Ils disent inconsciemment aux filles qu'elles sont des étrangères technologiques, et qu'indépendamment de leurs intérêts, il vaut mieux qu'elles se focalisent sur leur apparence et apprennent à obtenir satisfaction et estime de soi grâce aux soins et au service des autres : animaux, enfants, petits amis et, espérons-le, un jour, un mari.

Les jeux de filles pourraient potentiellement aider les filles qui grandissent dans des foyers très réactionnaires et ceux dont l'accès à la technologie est limité — et même leur contenu régressif renforçant les stéréotypes de genre peut permettre aux filles

d'acquérir des compétences technologiques en échappant au contrôle parental. Nous avons vu que certaines femmes sont entrées dans les disciplines des TIC en rébellion active contre leur éducation conservatrice au chapitre 5. Il est décourageant de constater que la seule façon dont certains parents seraient susceptibles de mettre des jouets technologiques à la disposition de leurs filles est de cautionner ces jeux dont les stéréotypes culturels de genre relèguent les femmes à la soumission ou à l'objectivation féminine ?

Si les jeux de filles transcendent rarement les ambitions consuméristes pour encourager la participation active à la production de jeux, quelques notes lumineuses se profilent à l'horizon. D'une part, la distribution et le marketing ne dépendent plus des magasins pour vendre des jeux dans des boîtes physiques. Les logiciels téléchargeables par le biais de différents "magasins" d'applications (iOS App Store, AndroidStore, WindowsStore, Mac Store, Steam, et tous les fabricants de consoles) ont changé les règles de financement, de production, de fabrication, de commercialisation et de distribution des logiciels, facilitant l'émergence de productions indépendantes. La technologie du « middleware » comme Unity abaisse le seuil technologique pour la fabrication de jeux vidéo. Xbox Live, Steam et app stores pour appareils à écran tactile permettent à toute une industrie de développeurs de jeux indépendants de produire et de sortir des jeux en contournant les commandes et contrôles stricts des fabricants de consoles. Le marché des jeux vidéo indépendants est en train de faire des expériences en ligne vraiment étonnantes, en mélangeant esthétique, genre, et classification. *Minecraft* a commencé comme ça. Certains de ces développeurs peuvent encore remplir le vide

laissé par les anciennes entrepreneuses féministes, mais sans s'inquiéter de "rencontrer les filles là où elles sont", parce que dans ces 20 années qui se sont écoulées, les filles ont rattrapé le fossé entre les sexes du côté des consommateurs.

10.2.4 Technologie neutre ou non-genrée

Mon point de départ, il y a six ans, était la première des cinq phases de la révision des programmes d'études de McIntosh (1983, 1990) (voir section 2.3.3.1) : l'absence de femmes dans la technologie. Comment encourager les femmes à vouloir entrer dans le domaine des TIC ? Comment pouvons-nous renforcer la résilience des femmes face aux stéréotypes de genre et à la menace de stéréotype ? Chaque phase de mes recherches m'a permis d'aller plus loin dans la révision des programmes d'études de McIntosh. Je me suis concentrée sur la phase 2 pour comprendre les réalisations des femmes dans le développement de technologies et de logiciels. Qu'est-ce qui différencie ces femmes ? Dans la phase 3, " les femmes en tant qu'anomalie ", j'ai examiné comment elles se positionnent par rapport aux règles et normes sociales par le biais des préférences personnelles (chapitre 4) et de l'identification des rôles genrés (chapitre 5). J'ai regardé comment les enfants ont négocié le jeu vidéo lors de l'atelier après l'école (chapitre 6). Depuis, j'ai progressé vers la phase 4 : les femmes en tant que technologie. Les femmes ont toujours été impliquées dans la technologie, dans des postes subalternes en tant qu'informaticiennes, assistantes de laboratoire, assembleuses de machines, et saisie de données. Les femmes qui occupent des postes techniques comme les infirmières et les ménagères modernes sont injustement décrites comme non qualifiées et incompétentes pour mieux dévaloriser ou ignorer leurs contributions à la société ou à l'économie.

Pourquoi ne sommes-nous pas plus présentes à la haute direction des entreprises et aux échelons supérieurs du gouvernement si ce n'est pas à cause des (nos) mythes et croyances selon lesquels les femmes sont le sexe faible, émotionnellement instable (ou trop ennuyeuse et stable, si cela convient à l'occasion) et technologiquement incompétente ? Devrions-nous même nous préoccuper de savoir ce que les petits soldats du #gamergate en colère pensent de l'illégitimité des femmes dans les jeux vidéo ? C'est un leurre et un gaspillage d'énergie.

La croyance est l'opposé du doute. Le discours féministe sème le trouble dans ces mythes en évoquant le manque de diversité dans les TIC comme un problème, une crise conduisant à la recherche de nouvelles solutions. Le manque de diversité est présenté comme un état contre nature qui peut conduire à remettre en question les croyances de ceux qui ne doutent pas encore. La recherche sur la culture d'entreprise, l'éducation aux STIM, la psychologie sociale et la représentation des médias progressent sur plusieurs fronts vers l'identification des différents aspects du problème de la diversité. Mes recherches automatisées sur Google, sur le genre et la technologie et sur le genre et les jeux vidéo, apportent un nombre toujours croissant d'articles qui apparaissent dans des pays de plus en plus divers, y compris en provenance d'Asie. Les initiatives de programmation pour filles, comme le Women Who Code ou Black Girls Code, sont mises à l'essai comme solutions possibles avec de plus en plus de fréquence et de succès. Ce flot constant de questionnements fait naître le doute au cœur du monde de la technologie masculine.

Le questionnement à propos des stéréotypes du hacker commence à semer le doute dans l'esprit des filles qui ont été nourries d'un régime régulier de boosterisme "girl

power" sans les outils, les moyens et la sincérité pour les soutenir. Les jeux de filles - qui envoient aux filles des signaux contradictoires indiquant qu'elles sont parfaites telles qu'elles sont, mais qui renforcent l'apparence et les soins - sont l'un de ces essais infructueux visant à saper l'hégémonie technologique masculine.

Dans le chapitre 4, nous avons vu qu'il y avait une absence de femmes avec des préférences MBTI de personnalité "Sensing" qui ont tendance à s'appuyer davantage sur des règles pour stocker l'information et prendre des décisions. La croyance non critique dans les stéréotypes de genre rend les femmes "Sensing" plus enclines à éviter les professions des STIM en croyant qu'elles ne leur conviennent. La neutralité de genre est une condition préalable pour attirer des jeunes femmes techniquement compétentes - qui peuvent ne pas être aussi individualistes, politiquement motivées ou sujettes à remettre en question les règles, normes ou stéréotypes que celles qui ont des préférences MBTI d'iNtuition - afin qu'elles puissent s'imaginer à la fois étudier et travailler dans une profession technique créative, non pas comme "Autre" symbolique, mais comme des membres d'une équipe commune.

Comment pouvons-nous commencer à déplacer les lignes de stéréotypes de genre qui ont une inertie significative, dont la stabilité inconsciente permet une prise de décision rapide et efficace et les rend si difficiles à redéfinir ? La théorie de la culture peut fournir une stratégie, mais il est important de maintenir une pression féministe continue exigeant la responsabilisation et la recherche et la mise à l'essai de nouvelles stratégies.

10.2.5 Théorie du raffinement culturel (Cultivation Theory)

Les jeux, comme tous les médias, sont des artefacts produits par une culture dont les croyances, les habitudes et les valeurs sont socialement définies et maintenues. Un jeu vidéo sexiste ou violent, en soi, ne rend pas soudainement une personne sexiste ou violente ; cependant, un artefact véhicule des messages qui peuvent renforcer d'autres valeurs sociales chères à une société. Par exemple, le Japon produit des jeux vidéo qui sont considérés comme hyper-violents et sexuellement déviants, mais des facteurs culturels comme le contrôle serré des armes à feu et une dévaluation de l'individualité en faveur de la coopération sociale signifie que la méso-sémiose de ses artefacts culturels (comme les jeux vidéo ou les mangas) n'est pas le bouc émissaire à la moindre (et relativement rare) explosion de violence dans la société japonaise. En d'autres termes, les valeurs sociales - et les législations, mythes, stéréotypes et idéologies qui réifient ces valeurs - créent le contexte de la sémiose pragmatique: déterminant quel phanéra fera signe et influençant chaque élément triadique d'un signe (dans la micro-sémiose), comment les signes sont interconnectés (dans la méso-sémiose) et quelles idéologies émergent (dans la macro-sémiose).

La théorie de la culture de Gebner & Gross (1976) a été développée à partir d'études sur la violence dans la culture américaine, initialement financée par l'administration Lyndon B Johnson sur l'influence de la violence à la télévision sur le public américain. "La télévision est un moyen de socialisation de la plupart des gens dans des rôles et des comportements standardisés. Sa fonction est en un mot, l'acculturation (Gross & Al, 1986, p. 17). Au cours d'une exposition prolongée, les téléspectateurs sont

conditionnés à des représentations sociales qui se déplacent lentement d'une position épistémologique à une autre.

Selon cette théorie, des émissions de télévision populaires comme *Modern Family*, une série provenant des Etats Unis qui dépeint la "normalité" non menaçante d'un couple homosexuel avec un enfant adopté, surtout en comparaison avec deux couples hétérosexuels hautement dysfonctionnels, ont peut-être fait plus pour promouvoir l'acceptation sociale de l'homosexualité en Amérique que deux décennies d'activisme pour les droits des homosexuels. Comparer la façon dont l'homosexualité à la télévision a évolué, passant de la représentation d'exclus déviants - seuls et misérables - à des représentations plus complexes et nuancées : *Modern Family* (homosexualité banlieusarde, sans danger et ennuyeuse pour les masses), *Game of Thrones* (homophobie injuste et homosexualité durement réprimée pour un personnage secondaire), *Queer as Folk* (l'homosexualité comme norme culturelle à San Francisco) et *Faking it* (prétendre d'être gay pour être cool à l'école secondaire). Le fait de montrer à la télévision la normalité sexuelle et complexe de ce qui était autrefois un sujet tabou au fil du temps a mené à une acceptation accrue de l'homosexualité et à une approbation majoritaire subséquente de son programme législatif comme le mariage homosexuel.

Les médias évoluent, et si cette théorie est basée sur la télévision "passive", la popularité et le succès des jeux vidéo peuvent s'ajouter à d'autres habitudes de visionnement sur Internet. Personne dans ma famille, par exemple, ne regarde la télévision programmée, à part les chaînes d'information le matin. Notre consommation de médias consiste à regarder des séries, des films et des émissions

sur Netflix et Youtube et à jouer à des jeux vidéo. Chaque personne conserve son habitude médiatique. L'exposition répétée à des représentations positives dans ces nouveaux médias devrait donc aussi modifier la perception de la réalité.

Si nous appliquons cette théorie à la représentation des femmes dans les STIM, elles entrent maintenant dans la même phase de "complexification transformatrice" que la représentation médiatique de l'homosexualité. Des modèles stéréotypés de TIC et de rôles scientifiques dans des séries télévisées comme *Big Bang Theory* et *IT Crowd* - des femmes scientifiques repoussantes, socialement ineptes et des femmes "normales" technologiquement incompétentes - ont évolué vers des séries comme *Halt and Catch Fire* (des femmes ingénieurs dans la révolution des premiers ordinateurs personnelles), *NCSI*, *CSI* (des femmes occupant des postes techniques au service des victimes de crimes) et des films comme *Imitation Game* (Joan Clarke et ses aventures avec Alan Turing), et *Hidden Figures* (les mathématiciennes afro-américaines de la NASA).) Ces représentations plus complexes, positives et nuancées des femmes dans le domaine technique montrent les défis et la résistance évidente que ces femmes affrontent, et arrivent à un moment où l'on accorde une plus grande attention au déséquilibre entre les sexes dans les TIC et les STIM. Les représentations de ces femmes, techniques mais "normales," sont les bienvenues si elles peuvent faire douter les gens des stéréotypes de genre : l'incompétence technologique en dichotomie avec l'incompétence sociale.

La théorie du raffinement culturel exige de la patience pour déplacer lentement les lignes rouges des idéologies de genre en cultivant un consensus de masse. Peut-on y

parvenir en améliorant la représentation technique des femmes dans d'autres médias comme les jeux vidéo ?

10.2.6 Le doute et l'effet boomerang

Ma thèse espère créer un doute sur la domination technologique masculine. Dans son discours-programme de la SWSX EDU en mars 2018, Danah Boyd parle des dangers du doute excessif dans le discours américain actuel. Elle explique que le doute est détourné par des vétérans chevronnés qui ont des programmes culturels spécifiques et qui savent qu'ils répandent de la désinformation. En semant les graines du doute dans l'esprit des téléspectateurs qui pourraient se méfier ou douter des médias (et des figures d'autorité en général) - c'est-à-dire en trollant les médias - on crée un effet boomerang qui augmente la croyance en une théorie du complot ou de "faits alternatifs", le plus une figure d'autorité essaie de le nier. En d'autres termes, réaffirmer une valeur comme "les femmes sont égales" à partir d'une position d'autorité réifie le doute sur sa validité.

> *"Les compétences linguistiques et de communication ne sont pas universellement appréciées. Ceux qui ne se définissent pas par cette compétence détestent entendre le défilé interminable de gens riches et puissants suggérant qu'ils sont stupides. Embrasser le fait d'être anti-PC est devenu une source de fierté, une tactique de résistance. La colère déborde, car les gens qui rejettent "l'establishment" sont heureux de voir les élites trembler devant le démantèlement de leurs institutions. C'est pourquoi il s'agit d'une guerre des cultures. Tout le monde croit faire partie de la résistance " (Boyd 2018).*

Cette figure d'autorité peut être une organisation gouvernementale, un professeur d'université, le WHO, le FBI, les médecins, la presse grand public, etc., et par le simple déni d'une théorie ridicule, cela crée une incitation à l'auto-investigation qui peut

mener au trou noir des résultats de recherche de Google manipulés pour créer des conclusions intellectuelles hautement imprévisibles.

> *"Grâce à mon privilège d'érudit, j'ai l'occasion de voir comment les connaissances et l'information expertes sont produites et j'ai un profond respect pour les forces et les limites de la recherche scientifique. Entourée de journalistes et de personnes travaillant à la diffusion de l'information, j'ai l'occasion de voir comment les incitations façonnent la production et la diffusion de l'information et les lignes de faille de ce processus. Je crois que les intermédiaires de l'information sont importants, que l'expertise aiguisée est importante et que personne ne peut jamais être pleinement informé. Par conséquent, je crois depuis longtemps que nous devons externaliser certaines questions et faire confiance à d'autres pour faire ce qui est juste pour nous en tant qu'individus et pour la société dans son ensemble. C'est ce que signifie vivre dans une démocratie, mais, plus important encore, c'est ce que signifie vivre dans une société.*
>
> *Aux États-Unis, nous nous dirigeons vers le tribalisme et nous détruisons le tissu social de notre pays par la polarisation, la méfiance et l'autoségrégation. Et que cela nous plaise ou non, notre culture du doute et de la critique, l'expérience plutôt que l'expertise et la responsabilité personnelle nous poussent encore plus loin dans cette voie. L'éducation aux médias demande aux gens de se poser des questions et de se méfier de l'information qu'ils reçoivent. Les gens le font. Malheureusement, c'est exactement la raison pour laquelle nous parlons au-delà de l'autre." (Boyd 2018)*

Les recommandations de Boyd pour contrer cette tendance sont de se concentrer sur le renforcement des capacités cognitives des gens plutôt que sur l'établissement de la véracité des faits qui peuvent être manipulés par le biais d'épistémologies multiples. Affirmer son autorité sur l'épistémologie ne fonctionne plus.

Il faut reconnaître les lignes de failles des élèves (en tant qu'acteurs de la réception), et non les lignes de failles du paysage médiatique de l'Internet qui ne peuvent pas être muselées ou contrôlées, et qui ne devraient pas l'être. Il faut se concentrer sur la création d'une éducation aux médias par le récepteur, et non par le diffuseur, pour lutter contre le doute manipulé et son effet boomerang. Voici les recommandations de Boyd :

1. Faire attention aux interactions para-sociales, c'est-à-dire connaître et s'identifier trop étroitement avec le messager.

2. Développer une empathie fondée et construire une distance émotionnelle en mettant en place des stratégies. Une personne doit interroger sa propre psychologie pour créer une perspective objective qui peut être utile pour l'analyse parce qu'elle crée une déconnexion cognitive.

    a. Séparer les différents signaux et réduisez leur portée.

    b. Lire le texte plutôt que de visionner la présentation multimédia.

    c. Sortir l'information du contexte.

    d. Se concentrer sur l'interrogation de sa propre psychologie pour créer une perspective objective.

3. Apprécier les différences épistémologiques. Pourquoi les gens avec des points de vue hétéroclites interprètent-ils l'information différemment ? Peirce soutiendrait qu'un interprétant (utilisé pour la sémiose) est contextuel.

4. Apprendre à vous accrocher à votre vision du monde tout en embrassant celle de quelqu'un d'autre. Cette pratique ethnographique consiste à apprendre à observer et à faire preuve d'empathie tout en gardant une distance consciente en tant qu'observateur. Les équipes de débat doivent aussi s'accrocher de façon cohérente à la perspective de quelqu'un d'autre, quel que soit son point de vue.

5. Trouver des problèmes cognitifs et identifier les biais de confirmation. Lorsqu'on leur donne des informations grossières, les gens ont tendance à remplir les blancs.

Ces stratégies visent à créer suffisamment de distance cognitive pour analyser les motifs sous-jacents tout en conservant ses croyances. Le doute peut conduire à la crise et à la recherche de nouvelles croyances/habitudes.

10.2.7 Heuristique de la neutralité de genre pour les expériences numériques des enfants.

En tant que concepteur et éducateur d'UX, les recommandations pour d'autres concepteurs confrontés au même paysage compliqué sont d'une importance primordiale. En accord avec la théorie du raffinement culturel, j'encourage fortement la neutralisation de toute production culturelle, jeux vidéo, livres, mangas, en particulier tout ce qui s'adresse aux enfants ou aux adolescents. En ne ciblant pas ou en supposant que l'on ne peut s'occuper que de 50% de la population d'un marché cible, nous devrions nous efforcer de trouver un terrain neutre sans supposer que le masculin l'emporte sur le féminin.

Les fabricants de jeux ont commencé à genrer leurs produits dans l'espoir de réduire la réutilisation intrafamiliale d'équipements comme les bicyclettes, les jouets et les jeux et d'augmenter les ventes. Cette stratégie toxique renforce les stéréotypes et autres mythes culturels qui créent la hiérarchie des genres. Les préoccupations primordiales des filles et des femmes au sujet des apparences corroborent la conscience de soi de l'objectivation féminine, créant des répercussions

phénoménologiques dans le sport, l'estime de soi et la confiance en soi. L'attention et le dévouement aux autres devraient être cultivés autant chez les garçons que chez les filles. Le souci des apparences et le dévouement aux autres, lorsqu'on s'attend à ce que ça soit exclusivement des préoccupations féminines, créent un énorme déficit de temps et d'attention qui pourrait être consacré à la recherche de la réussite.

Si nous voulons déconstruire la macro-sémiose qui considère les disciplines scientifiques et technologiques comme des activités masculines, nous devons repenser la façon dont nos artefacts et leurs cycles métaboliques renforcent cela. Pour ce but ultime, je propose humblement l 'heuristique suivante de neutralité de genre que les concepteurs devraient prendre en considération lorsqu'ils conçoivent les expériences numériques des enfants :

1. **Concevoir pour les enfants dans la mesure du possible, mais ne pas confondre les catégories "enfants" et "garçons"**. La masculinité n'est pas une catégorie neutre et universelle. En utilisant le terme "enfants" lorsqu'on utilise les normes masculines des garçons comme norme sociale - et en traitant les filles comme un groupe d'intérêts spéciaux distinct - renforce simplement l'hégémonie masculine. C'est l'approche de Playmobil dont les jeux sont classés comme pour des enfants et pour des filles. Les boîtes bleues contiennent des jouets d'enfants concentrés sur des thèmes de pirates, chevaliers, super-agents, policiers, etc. Les boites roses spéciales contiennent des jouets aux thématiques domestiques destinés à une catégorie spéciale d'enfants, les filles. De même, les classiques de la littérature pour enfants qui se concentrent principalement

sur des thèmes masculins ne sont pas non plus neutres du point de vue du genre. Il en sera question au point 7.

2. **Éviter l'essentialisation des catégories "garçon" et "fille"** en évitant les stéréotypes de genre dans les intérêts, les comportements, les préférences de catégories de jeu, les contextes sociaux, les couleurs, les matériaux/finition, ou le sujet, dans la mesure du possible. Vous trouverez ci-dessous quelques stéréotypes sexistes courants :

   Garçons = aventures en plein air ; expérience, habileté et courage ; compétition ; amour de l'action et du réflexe rapide ; amour de la violence et du contenu agressif ; utilisation de couleurs sombres ou saturées, en particulier le bleu.

   Filles = aventures à l'intérieur ; timidité, manque d'expérience, peur et manque de passion ; amour de la narration et de la réflexion, ou pire, narcissisme et superficialité ; accent sur les soins de beauté, la mode, les liens sociaux et le soin des autres; utilisation de couleurs pastel légères et de paillettes.

3. **Réfléchir à la manière dont les modèles masculins et féminins sont représentés, en particulier les rôles d'adultes dans les médias pour les jeunes enfants**. Comment les adultes sont présentés aux enfants, par exemple en évitant le stéréotype de la mère dans la cuisine et du père assis à lire le journal. Montrer des modèles masculins engagés dans le soin des autres et révélant une profondeur émotionnelle, et proposer des modèles féminins qui se manifestent à l'extérieur de la maison. C'est la norme sociale ; nos médias devraient en tenir compte.

4. **Si vous concevez pour les filles, évitez l'esthétique sexuée, surtout si votre marché cible est l'adolescence**. Le rose est une méso-sémiose marketing destinée aux parents et aux distributeurs pour identifier facilement les produits pour les filles (LoBue&Deloache 2011 ; Weisgram& Al. 2014 ; Cunnigham&Macrae 2011 ; Wong &Hines 2015b ; Fine & Rush 2016). À moins que votre recherche de design n'identifie le rose ou le pastel comme étant la couleur préférée de votre marché cible, ne présumez pas que le rose ou le pastel est la couleur préférée des filles. Chez les adolescentes et les femmes adultes, l'esthétique stéréotypée selon le sexe est souvent la cible de ridiculisation et de réactions négatives à l'égard de stratégies de conception et de communication inappropriées.
5. **Si vous concevez pour les garçons, n'hésitez pas à utiliser une esthétique et des sujets transgressifs**. Les garçons méritent un répit de l'hégémonie masculine avec des couleurs claires, des étincelles, de la beauté et l'encouragement à prendre soin des autres dans un cadre privé, au-delà des exploits publics héroïques.
6. **Éviter d'ajouter des caractéristiques secondaires stéréotypées féminines aux artefacts scientifiques ou technologiques destinés au jeu de l'enfant.** Non seulement vous réduisez artificiellement votre marché cible de 50%, mais cela renforce une macro-sémiose transgressive de genre qui réifie la science et la technologie comme masculine. Si la science et la technologie doivent perdre leur association masculine artificielle et culturellement construite, nous devons la traiter comme un territoire neutre et non

comme un territoire hostile. Les jouets et les jeux scientifiques ou technologiques devraient être agréables pour tous les enfants.

7. **Une bonne structure narrative devrait être fournie pour tout le monde.** Une bonne histoire est immersive et permet aux joueurs de transcender le support avec lequel ils interagissent physiquement (par exemple, souris, écran, clavier, écran tactile, contrôleur de jeu, etc.) Tout le monde mérite un récit intéressant avec des personnages complexes (de n'importe quel sexe) - qui peuvent avoir des aventures passionnantes et montrer des faiblesses - que la culture des fans peut embrasser et développer a leur guise.

   Note : Mon commentaire sur la représentation des hommes et des femmes parmi les modèles de rôle est important ici aussi. La littérature pédagogique suppose souvent que les "classiques" sont neutres et ont tendance à favoriser fortement les héros masculins, par exemple *Moby Dick* et *The Adventures of Tom Sawyer*, en supposant que les garçons n'auront aucun intérêt à lire les récits d'héroïnes féminines comme dans *Little Women* ou *Pride & Prejudice*. La littérature classique avec des protagonistes féminines, en vertu du contexte restrictif de l'auteur, tend à renforcer la sphère domestique en tant que domaine des femmes et la nature passive des protagonistes féminines - qui cherchent à survivre/escalader socialement. Si la littérature classique peut rendre les filles incroyablement reconnaissantes de ne pas être nées plus tôt, ces romans impliquent aussi un statut secondaire pour les femmes auteurs, qui, comme les femmes peintres du XIXe siècle, ne pouvaient se

concentrer que sur des thèmes domestiques sans désapprobation sociale. Alors que les restrictions sociales de ces femmes sont exaspérantes, cette littérature fait aussi douter les filles de leur action dans un monde qui pourrait ne pas être aussi accueillant pour les femmes qu'elles l'imaginaient. La littérature contemporaine (en vertu de la libération des femmes) présente des personnages féminins capables d'héroïsme et de sacrifice qui peuvent être de meilleures approches pour plaire aux enfants des deux sexes.

8. **Dans les jeux vidéo, fournir des variations optionnelles de gameplay en fonction des niveaux, d'habileté, et des intérêts des joueurs**, comme un mode touristique dans les jeux d'aventure, des scènes de combat à sauter, des versions non chronométrées, des versions alternées, etc.

De merveilleux exemples de jeux non sexistes sont déjà en cours de production, la liste des titres de la Gaité Lyrique (figure 6.6) est déjà un excellent point de départ. Je ne rêverais jamais de proposer une heuristique pour des jeux vidéo neutres de genre dans l'espoir de suggérer une formule pour atteindre le jackpot du marketing d'un jeu vidéo. Je ne suggère pas non plus que les canons rétrogrades de l'industrie du jeu vidéo - titres sexistes et violents AAA ou jeux de filles - doivent être abolis. Dans une société néolibérale, les artefacts continueront d'être créés si le public est là pour les acheter.

La culture du jeu indépendant doit être encouragée à continuer à prendre des risques, à brouiller les frontières entre les catégories, les genres et les publics. Ces jeux alternatifs doivent atteindre un public plus large parce qu'ils existent.

Les parents doivent être encouragés à ne pas considérer les jeux vidéo comme un ennemi pour leurs enfants, et à les aider activement à améliorer la consommation des médias en fonction des valeurs qu'ils veulent transmettre à leurs enfants, ce qui peut être bon ou mauvais, mais qui au moins est fait consciemment. Le fait d'assimiler automatiquement le temps passé devant un écran à des influences négatives transfère simplement la curiosité de l'enfant à d'autres sources d'orientation qui peuvent, une fois de plus, mener à des conclusions imprévisibles. Les jeux vidéo peuvent jouer un rôle très positif dans le développement de l'enfant, mais les parents doivent s'impliquer pour aider leurs enfants à choisir de meilleurs jeux vidéo, ce qui est plus facile à dire qu'à faire.

10.2.8 Idéaux modernistes dans un contexte post-moderne

Le modernisme est imprégné d'idéaux objectivistes, universels et humanistes. (Habermas 1993) Artistes, designers, ingénieurs et architectes croient souvent que leur mission est une mission humaniste progressiste - par la construction d'artefacts pour proposer de nouvelles et meilleures façons d'être (Simon 1968). Le post-modernisme est une question de complexité, de nuances, de scepticisme, de contextualisme, de tribalisme et de subjectivisme. Les jeux de filles incarnent des idéaux modernistes naïfs dans un contexte post-moderne compliqué.

Une métaphore pertinente pour le mouvement des jeux de filles peut être trouvée dans les projets de gratte-ciels modernistes, construits dans les périphéries des villes américaines dans les années 1950 et 1960, comme le Pruit-Igoe à St Louis, Missouri. (1954 –1972). Basés sur les idéaux modernistes de Le Corbusier et du mouvement CIAM (Congrès internationaux d'architecture moderne), ces projets de démolition des

bidonvilles étaient remplis d'ambitions sociales utopiques pour offrir de meilleurs logements aux masses. Les échecs répétés et spectaculaires de bon nombre de ces projets de logements publics montrent les limites de la conception d'artefacts lorsque des politiques sociales malveillantes étaient en place et qu'elles allaient à l'encontre des ambitions naïves et idéalistes du modernisme. Les projets de logements modernistes de grande hauteur fonctionnent bien lorsqu'ils sont désagrégés en terme de groupes ethniques ou de classe sociale et intégrés dans le tissu urbain avec un entretien adéquat, des services sociaux et des transports publics à proximité.

En d'autres termes, les jeux de filles (ou même les jeux vidéo) ne peuvent pas contrer le milieu masculin de la technologie. Croire qu'un artefact peut convaincre quelqu'un de choisir une formation ou un cheminement de carrière qui signale clairement qu'il sera un étranger, impose à la personne le fardeau de s'adapter au milieu. Mise à part la minorité de femmes rebelles qui sont moins sensibles aux règles et dont résilience leur permet d'ignorer ou de surmonter les stéréotypes négatifs, la plupart des femmes ne choisiront pas une discipline si elles pensent qu'elles devront aiguiser leurs fourches pour franchir les barricades de la technologie ou pour se défendre une fois à l'intérieur. Les jeux de filles encouragent simplement une méso-sémiose du statut des femmes en dehors de la norme dans les TIC.

Tout comme les lois et les politiques sociales racistes ont annihilé d'énormes investissements dans le logement public aux États-Unis, la monoculture masculine blanche de la technologie doit d'abord être neutralisée. Se concentrer sur les artefacts et espérer qu'ils peuvent effectuer des changements par l'interaction de

l'utilisateur est une stratégie perdante si un contexte macro-sémiotique invisible et omniprésent travaille activement et efficacement contre ce changement.

10.2.9 Les barbares postmodernes à la porte d'entrée

En conclusion de l'objectif initial de mes recherches, faire entrer les femmes dans la production des TIC revient à remettre en question la raison d'être de la monoculture masculine. Après 5000 ans de patriarcat, les femmes ont fait des progrès sociaux spectaculaires dans d'autres disciplines comme le droit et la médecine au cours des 50 dernières années. Les TIC sont l'un des derniers bastions de la domination masculine, mais le doute apparaît dans les mythes que l'on nous réitère.

Le doute mène à la crise - non seulement chez les hommes qui craignent de perdre leur statut, mais aussi chez les femmes qui ont appris à croire en leur incompétence technologique, quelles que soient leurs capacités, leurs performances ou leurs intérêts. La monoculture masculine des TIC n'est pas naturelle ; elle est renforcée par les stéréotypes de genre et de technologie qui réifient la croyance qu'un sexe est plus talentueux et adapté à un travail technologique compliqué et que ce sexe mérite une meilleure compensation.

Les TIC sont en pleine guerre économique des sexes. Plus précisément, les stéréotypes liés au genre et à la technologie sont utilisés pour renforcer la domination économique masculine, et tout mythe non fondé peut être utilisé pour renforcer ces croyances : hormones, structures cérébrales, motivation ou compétences en mathématiques. Ces besoins doivent être contrés par la pédagogie, la patience et la persévérance.

La représentation des femmes est importante, mais pas seulement dans les jeux vidéo : aussi à la télévision, dans la publicité, les livres pour enfants et les films. La représentation des femmes scientifiques, programmeurs et *hackers* doit devenir moins stéréotypée ; cependant, ces préoccupations ne doivent pas nous distraire de l'image d'ensemble. La monoculture masculine blanche des TIC et ses lacunes insulaires doivent être rendues plus visibles. Il n'y a pas d'incompatibilité avec la participation des femmes aux TIC ; il n'y a que des croyances destinées à protéger sa minorité dominante.

10.10 Prochaine étape : La recherche-action discrète de l'éducation des TIC

En automne 2018, ma recherche sur le genre et les TIC se poursuivra au-delà de cette thèse par la recherche-action dans une grande école de programmation informatique à Paris, l'Ecole 42 financée par le milliardaire technologique français Xavier Niel. Cet établissement d'enseignement prestigieux, sans frais de scolarité et sans diplôme officiel, offre un programme de trois ans pour les 18-30 ans et un programme spécial d'un an pour les "seniors" (de plus de 45 ans) que je vais rejoindre. Ouvert 24 heures sur 24, le programme innovant de l'Ecole 42 est structuré autour de l'apprentissage *peer-to-peer* et du travail en groupe dans des parcours auto-définis. L'examen d'entrée très compétitif est un atelier de programmation immersive d'une durée d'un mois, 7 jours par semaine, appelé la piscine, avec des projets de 48 heures les weekends qui encouragent les étudiants à dormir (et avec un peu de chance à se doucher) sur les lieux dans l'espoir de completer un projet pour le lundi matin. La piscine a un taux d'abandon de 20 à 30% en raison de son rythme frénétique. L'élève idéal de l'Ecole 42 est un jeune *hacker* obsessionnel et cool, un stéréotype masculin

qui conduit à des habitudes de travail malsaines et qui est souvent considéré comme incompatible pour les parents et la vie de famille.

Bien que les *hackers* du 21e siècle ne rentrent pas chez eux pour dormir, on s'attend maintenant à ce qu'ils maintiennent un certain niveau d'hygiène corporel. Il y a autant de cabines de douche privées que de cabines de toilette dans le bâtiment, et les serviettes mouillées bordent les rambardes des escaliers et couloirs les unes après les autres.

Ma recherche-action d'observateur discret se penchera sur la façon dont les programmes éducatifs "innovants" renforcent l'hégémonie masculine dans les TIC à travers un idéal néolibéral qui réifie le stéréotype daté du *hacker* compulsif (bien qu'avec une meilleure hygiène).