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Painting the Leaky Pipeline Pink: Girl Branded Media and the Promotion of STEM

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Painting the Leaky Pipeline Pink:
Girl Branded Media and the Promotion of STEM

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Arts in Communication

by

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Abstract

This thesis provides a critical feminist analysis of girl branded media depictions of girls in STEM. Through close textual analysis of three case studies—Disney Fairies films, *Barbie: Dreamhouse Adventures*, and My Little Pony: *Equestria Girls* media—I found that such STEM promotion tends to emphasize traditional gender roles and neoliberal market values. Disney Fairies films promote traditional gender roles via portrayals of play STEM, white hegemony, and western beauty standards. Additionally, these films promote the neoliberal ideal of industrialization as consequence free. *Dreamhouse Adventures* depicts STEM in relation to traditional gender norms such as caretaking, heteronormativity, and girl culture. Furthermore, this show normalizes neoliberal market values such as surveillance, consumerism and entrepreneurship. *Equestria Girls* relates traditional gender roles and STEM in terms of feminized STEM portrayals, depicting girls in STEM as dangerous, and portraying pretend science that has no basis in reality. Ultimately, I argue that these two main themes contribute to the structure of the leaky pipeline, which serves as a central metaphor for the absence of women and minorities in STEM fields. Finally, I explore the implications of these themes, potential drawbacks of the leaky pipeline metaphor, and future possibilities for the promotion of girls in STEM.

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Introduction

STEM Power: Sparking Girls' Interest in STEM

A little white girl opens her birthday present, gasps, and exclaims in delight: “A Millie Dresselhaus doll!” The viewers see a doll of an old scholarly looking white lady. The video cuts to a picture on Facebook of the little girl smiling while proudly holding her doll for all the world to see. So begins the 2017 General Electric (GE) ad showcasing what the world would be like if scientists such as Millie Dresselhaus, first woman to win the National Medal of Science in Engineering, were given celebrity status. The ad continues with mostly white girls dressed up as Dresselhaus for Halloween, white women wearing Dresselhaus t-shirts, and many newborn white babies with the first name Millie. At the ad’s conclusion, GE states its dedication to bringing gender parity to their entry level hires, while flashing on the screen pictures of diverse women with their names and GE job titles (Cause Marketing, 2017). While the primarily white imagery contradicts the diversity emphasized at the end, this ad does demonstrate the power of celebrity and the importance of representation. By doing so, the advertisement tries to address the lack of women in the science, technology, engineering, and math (STEM) fields. Marian Wright Edelman, President of the Children’s Defense Fund, perfectly captures the perceived root of the lack of women in the STEM fields by stating “You can’t be what you can’t see” (Newsom & Acquaro, 2011). In other words, many believe that the lack of representation of women in STEM fields may be the result of underrepresentation of female scientists in the public eye, particularly in popular culture.

In response to this lack of representation and visibility, scholars have analyzed the representation of male and female scientists in a variety of popular culture contexts. Specifically, previous scholarship has examined representations of gender in science education television

(Long, Boiarsky, & Thayer, 2001), the portrayal of scientists across television genres (Long et al., 2010; Ryan & Steinke, 2010), the representation of women and girls in relation to STEM across media platforms (Colatrella, 2011), and the portrayal of scientists in children's trade publications (Rawson & McCool, 2014). Furthermore, many other scholars have investigated the level of enjoyment that children – both boys and girls – receive from watching science television (Mares, Cantor, & Steinbach, 1999), what stereotypes children associate with scientists (Cho, Goodman, Oppenheimer, Codling, & Robinson, 2009; Özel, 2012; Steinke et al., 2007), and how girls react to feminine STEM role models (Betz & Sekaquaptewa, 2012). These explanations grounded in media influence add to the rich scholarly discussion about gender disparity in STEM fields. For instance, many scholars have studied why girls see STEM careers as unthinkable (Archer et al., 2013; Cheryan & Plaut, 2010; Mulvey & Irvin, 2018; Simon, Wagner, & Killion, 2017), how experiences in early childhood to adulthood affect STEM aspirations (Ceci, Ginther, Kahn, & Williams, 2014; Saucerman & Vasquez, 2014), and how structural institutional obstacles function over time (Blickenstaff, 2005; Ceci & Williams, 2011; Cheryan et al., 2017; Dasgupta & Stout, 2014). However, previous studies linking the underrepresentation of women in STEM fields to the representation of females in mass media leave an important gap in the literature. These studies primarily focus on adult and children's media intended for broad audiences. This limited focus says little about how brand media specifically developed for girls influences their perception of STEM fields. Girl media, especially that which is linked to iconic brands, often utilize similar elements of girl culture, in particular, magic, fashion, music, and royalty. Thus, we are left with these questions: How does the reinforcement of girl culture complicate STEM promotion? Moreover, how do these representations of STEM get complicated by content connected to consumer brands in girl culture that are simultaneously trying to sell a product?

In this thesis, through a critical feminist lens, I will use close textual analysis to explore how STEM is valued in girl branded media. Additionally, while STEM effects have been studied across multiple genres for gender stereotypes and other representational effects, few have investigated the use of popular children's brand icons to promote girls in STEM. In the following sections, I define the problem of the leaky pipeline in STEM, and discuss the ways people – including government officials, nonprofit organizations, and even corporations – are currently trying to address those leaks by feminizing science in kids toys and girls entertainment media. Finally, in laying out the theoretical approach to this thesis, I present the current state of media and girls in STEM research by discussing how such content usually perpetuates gender stereotypes; in describing previous studies on the subject, I argue for greater attention to STEM depictions and gender roles specifically in girls media. I then explore brand culture and how it applies to the commodification of STEM, so that I might better establish how girls media promotes neoliberal postfeminism. Following these discussions, I will give an overview of the chapters.

The Leaky Pipeline

According to the National Science Foundation (2014), women made up 23% of the general STEM work population in 1993, a number which grew to 28% by 2010. However, this percentage plateaued through 2018 (National Girls Collaborative Project (NGCP), 2018). These statistics are baffling since studies comparing girls to boys in math and science during much of that same period have shown that girls consistently had higher average GPAs in those areas (Hill, Corbett, & St. Rose, 2010). In fact, these days K-12 girls and boys are taking advanced math and science courses at an equal rate (NGCP, 2018). At the collegiate level, women earn 50% of the degrees in STEM but women tend to focus on STEM activities outside of engineering and the

computer sciences. Additionally, the representation of minority women is abysmal, as they make up less than one in twenty STEM workers in the United States. This is less surprising as 87% of STEM graduates are white or Asian, whereas only 2.7% are black women, 3.6% are Latina, and 3.1% are other minority women underrepresented in STEM (NGCP, 2018). Although the number of women receiving bachelor's degrees in STEM fields has generally trended upward since 1966, it has yet to equitably translate into the workforce. This phenomenon was first described by Sue Berryman in 1983 as the leaky pipeline (Pawley & Hoegh, 2011).

Since the early 1980s, the leaky pipeline metaphor has dominated the field of education research and popular discourse (Pawley & Hoegh, 2011). The leaky pipeline is the commonly used metaphor for women dropping out of STEM due to various age-related social pressures (Colatrella, 2011). A whole host of explanations have been offered for the phenomenon. For example, Saucerman and Vasquez (2014) explain that parental and teacher influence remain vital from early childhood to adolescence in forming children's opinions regarding their social roles and skills. In early childhood, "preschoolers vary greatly in their mathematical knowledge" (p. 47). This is due to how often "parents engage their children in counting and number matching" leading up to preschool (p. 47). In terms of gender, it is likely parents begin number talk with male infants sooner than female infants. It has also been found that teachers with math anxiety are more likely to influence female students' math confidence in early elementary education (Saucerman & Vasquez, 2014). Furthermore, "teachers evaluate their male students' mathematical ability as being higher than that of female students" (p. 1).

In addition to the influence of parents and teachers, peer and media influence become more prominent in shaping children's ideas about STEM during their childhood. Depending on whether peer interests lean towards the standardly feminine or towards the STEM fields, girls are

found to be more likely to hold similar interests and beliefs as their friends. In popular children's media, girls are more likely to see female protagonists reflecting dominant gender norms which are characterized by acts of caretaking, physical grooming, and passivity (England, Descartes, & Collier-Meek, 2011; Zipes, 1995). They are also unlikely to see many positive female role models who practice science that do not ultimately become undermined by a male protagonist or buy into a patriarchal notion of happiness (Colatrella, 2011; Wasko, 2001). These representations in conjunction with parental and teacher attitudes towards math shape girls' views on whether they can excel in STEM. In turn, this leads to susceptibility to "stereotype threat" in adolescence, a phenomenon referring to girls underperforming when stereotypes about girls' lack of skill in STEM are made salient (Saucerman & Vasquez, 2014).

In 1998, the American Association of University Women (AAUW) found that middle school girls typically lose interest in science (Ryan & Steinke, 2010). As Saucerman & Vasquez (2014) explain, adolescent girls are more likely to be plagued by a "fixed mindset" and are strongly influenced by their mothers' career expectations for them (p. 52). A fixed mindset is "the notion that academic ability is a fixed characteristic that a person either has or does not have" (p. 52). In terms of STEM abilities, this means many girls feel that there is no hope of improving their talents in STEM. In interviews with girls who did not hold STEM aspirations, Archer et al. (2013) found girls deem STEM unattractive because it is "not nurturing, not glamorous/girly and not 'practical,'" and that their views appear aligned with parental attitudes regarding STEM (p. 187). Thus, in terms of childhood, many systemic road blocks exist to discourage girls from STEM before they even consider college.

As females enter adulthood, starting with college and entering the workplace, the obstacles shift. A factor more likely to influence the selection of a college degree is goal

affordance. Women are more likely to choose jobs that work towards communal goals which benefit society and STEM work is often perceived as an agentic field, meaning it is more likely to benefit on a personal level. Thus, based on the agentic perception of science, women are more likely to choose a college path that leads to a more communally focused career (Diekman et al., 2010; Diekman, Weisgram, & Belanger, 2015; Saucerman & Vasquez, 2014). However, it is important to note that women and men value both communal and agentic goals, each at varying degrees by person (Simon et al., 2017). Another obstacle is that stereotype threat likely leads women to be prevention focused, meaning their focus is on doing well enough to keep their jobs. As such, they focus on professional dress, work attendance, and project timeliness, rather than promotional goals that lead to advancing their position in the workplace. Promotional goals focus on reasonable risk taking, active participation, and salary and advancement negotiation. Another obstacle has to do with a warmth versus competence theory that ascribes how others perceive a person based on how warm or friendly they seem compared to how competent they are in their work. Successful women in male dominated fields such as STEM are often perceived as “uncivil, cold, and ‘bitchy’” (Saucerman & Vasquez, 2014, p. 57). A woman who is too nice in a male dominated profession is likely to be seen as incompetent. As such, no matter how women are perceived, they are likely to be passed over for promotion for either a perceived lack of interpersonal skills or a perceived lack of competence (Simon et al., 2017). The consequence is that women tend to be excluded from higher echelons in STEM. A final obstacle is how researchers use differences between men’s and women’s brain functioning to justify sexist notions of women being inherently incompetent in STEM. While differences may exist, there is a clear history of skewing the literature to reflect poorly on women’s STEM related abilities (Fausto-Sterling, 1992; Saucerman & Vasquez, 2014). In sum, previous scholarship has linked

the leaky pipeline to women's experiences throughout their lives and is ultimately the product of larger cultural biases that lead them away from STEM fields.

Bandaging the Leaky Pipeline

In response to girls not finding STEM feminine enough, the last decade has seen many attempts by various governments, startup companies, and well-known toy manufacturers to feminize science and ultimately patch the leaky pipeline. In 2012, the European Commission released an ad featuring feminine models loosely engaging with science, posing provocatively to the tune of hip music. Due to complaints, the video was later pulled (The Young Turks, 2012). However, this kind of possible backlash has not stopped female engineers from developing toys in pink and purple such as Goldiblox (Sterling, 2018) and Roominate (Scholastic Parents Staff, 2018), each designed by women in STEM in hopes of teaching young girls early STEM skills already found in boys toys. Additional examples of feminized STEM toys include Jewelbotz, Blink Blink, and LinKitz (Fenn, 2015). Of note, Kina McCallister, a former cancer research lab technician, started a company called STEMBox, which functions as a monthly subscription service for STEM experiment kits targeting young girls. It is important to recognize that many of these new toys are quite pricey (Fenn, 2015), thus limiting their market to those with a higher socio-economic status, which is less likely to include minorities.

The feminine STEM toy trend has even influenced more traditional toy manufacturers, such as LEGO. LEGO toys have long been associated with the early development of visual spatial skills which are crucial for most STEM fields (Knudsen & Kuever, 2015; Reich et al., 2018). In a 2011 article for *The Guardian*, LEGO UK managing director Marko Ilincic explained that girls were an untapped market and LEGO was working to develop toy lines that had “the right balance of creativity that appeals to girls and construction” (Bawden, 2011). In 2012,

LEGO released LEGO Friends, which is a product line that sells feminized Lego figurines and building sets in pink and purple representing traditional feminine roles such as princesses and caretakers (Knudsen & Kuever, 2015; Reich, Black, & Foliaki, 2018). In 2015, LEGO released LEGO Elves, a set featuring magical female elves for girls. They even created a Netflix cartoon show to accompany both LEGO Friends and LEGO Elves. In 2017, LEGO released a new line called Women of NASA which includes prominent STEM figures such as astronomer and mother of the Hubble Telescope, Nancy G. Roman, the computer scientist who calculated the Apollo 11's moon landing, Margaret Hamilton, and astronauts Sally Ride and Mae Jemison (Chandler, 2017; Reichstein, 2017; Williams, 2017). The set was developed from an idea submitted to the company by Maia Weinstock of NASA (Williams, 2017). Each set comprises elements that best fit the women's contributions to NASA. For example, Nancy G. Roman comes with a Hubble Telescope and an image of a planetary nebula; Margaret Hamilton has a science lab and stack of books resembling a guidance computer; the astronauts both come with a launch pad and shuttle craft with detachable rockets (Reichstein, 2017; Williams 2017). With regards to her idea, Weinstock said that she "wanted to contextualize each person in terms of her contribution to NASA history" and "thought people might like to build their own display featuring ... accomplished women" in STEM (Williams, 2017, para. 6). Additionally, LEGO has two lines targeted at both boys and girls, LEGO Mindstorms and LEGO Boost, that allow children to build robots. Clearly, with its roots in developing STEM skills, LEGO has wholly embraced the new trend towards STEM specific toys.

Other brands have also jumped on the trend. MGA Entertainment created Project Mc², a STEM centered doll line with an accompanying live action Netflix show. The experiment kits for the line largely center on creating bath, beauty, and fashion products. According to the

ProjectMc² website, the line was designed “to help advance girls in the areas of S.T.E.A.M. (Science, Technology, Engineering, Art and Math)” and has won multiple awards for its experiment kits and Netflix show (MGA Entertainment, n.d.). In 2010, Mattel worked with the National Academy of Engineering and the Society of Women Engineers to produce Computer Engineer Barbie (Miller, 2010). In June 2018, Mattel released Robotics Engineer Barbie that comes with online coding lessons (Eckert, 2018). This year, Mattel designed a line of scientist Barbie dolls with input from Sapna Cheryan, University of Washington Associate Professor and STEM stereotype expert (Eckart, 2018; Eckart-Washington, 2018; Leguizamon & Ahmed, 2018). According to a statement from Mattel, they “picked Cheryan [to be on their Barbie Global Advisory Council] because of her research on diversity, stereotypes and gender gaps in STEM” which helped inform their creation of career-themed dolls and related items (Eckart, 2018, para. 6). These efforts seem to reflect Mattel’s Barbie slogan “You Can Be Anything” (Mattel, 2018).

Unfortunately, all these efforts may be for naught. Specifically, a burgeoning body of academic work has started to question whether feminizing STEM to change the perceptions of young females is really an effective tactic. For example, sociologists Anna Betz and Marcia Sekaquaptewa (2012) set up an experiment in which middle school girls evaluated college girls who were profiled as either successful in STEM or more generally. In their pictures for the profiles the college student was either dressed femininely or not. They found that girls who are already not interested in STEM were even more likely to be discouraged by feminized role models. Betz and Sekaquaptewa (2012) speculate this is due to their perception that a woman who is both very feminine and a scientist is unrealistic and unattainable given their schema regarding females in science. They consider the effect to be similar to stereotype threat in that it made the students “prefer the safe and known over the risky and unknown” (p. 6). It also reflects

findings that women's pursuit of romance affects their attitudes toward math and science.

Generally, women who are trying to impress men perform fewer STEM related behaviors (Park, Young, Troisi, & Pinkus, 2011).

Additionally, other critics have suggested that the general message behind efforts to feminize STEM fails to make more important arguments about the role of women in such fields. While various attempts have been made by organizations and, even some education scholars partnering with corporations, Jessica Heybach and Austin Pickup (2017) argue that most interventions are formulated to show how STEM can benefit girls and minorities, rather than the more radical notion that girls' and minorities' involvement in STEM can help transform the field and produce less biased experimental designs and interpretations of findings. Such sentiment can be found in statements such as "we must do what we can to prepare and encourage all students to pursue STEM careers" (Ryan & Steinke, 2010, p. 49).

Despite doubts about the effectiveness in promoting STEM by feminizing kids toys, these efforts to patch the leaky pipeline have recently led to a surge in more gender neutral representational media targeting the same children. For example, Netflix recently revamped *The Magic School Bus* with their new show *The Magic School Bus Rides Again*, which follows the adventures of Ms. Frizzle's younger sister, Ms. Fiona Frizzle, as she takes over Ms. Frizzle's elementary class. The new series is intended to encourage kids' creativity and curiosity regarding 21st century scientific innovations (Targeted News Service, 2017; Thaxton, 2017). In 2018 Disney released a live action version of the Madeleine L'Engle classic *A Wrinkle in Time*, which features Meg Murray, a young biracial girl intrigued by science due to her scientist parents, played by Storm Reid. In the making of the film, director Ava Duvernay emphasized the importance of diverse casting and science (Denio, 2017; JetBlue Airways, 2018). Not only did

Duvernay hire Brown University physicist Stephon Alexander to be the film's science advisor (Becker, 2018), but Duvernay was invited by JetBlue Airways in partnership with Girls in Tech to kick off their conference held to launch their "tech empowerment initiative" (JetBlue Airways, 2018, para. 1). In 2017, Nickelodeon debuted their new show, *I Am Frankie*, about an android that looks like a teenager and was created by Dr. Sigourney Gaines. While the show raises questions regarding the use of technology, it does not heavily focus on promoting STEM (Ashby, 2017). However, it has been enjoyed by audiences of all ages (Ashby, 2017), proving that a show can highlight science elements and be broadly appealing. Similarly, the new Disney Channel animated series, *Star Wars: Resistance*, features a female mechanic, Tam Ryvora, and a pilot, Torra Doza. The series itself mainly focuses on Kaz, who is a resistance pilot who is trying to find a first order intelligence leak on his new home of Colossus (Trumbore, 2018). Therefore, the STEM aspects of the female characters are tangential to the show but still provide new avenues of representation. While most of these examples may seem more targeted at females, given their female leads, their content is less focused on fusing traditional feminine stereotypes with science.

Gender Stereotypes and Representation of STEM in Film and Television

According to Peggy Orenstein (2011), a *New York Times* bestselling author and journalist, girls toys, such as My Little Pony, Barbie, Bratz, and their accompanying media products (i.e. tv shows and websites) direct girls "toward very specific definitions of both girlhood and play" (p.162). These products define girlhood in terms of shopping, fashion, makeovers, and home decoration, while limiting girls' aspirations to celebrity or rock star status. Throughout her book, *Cinderella Ate My Daughter*, Orenstein argues that popular media exposure at a young age helps shape who girls grow-up to be. The picture she paints is grim, with young women being less ambitious, more likely to be depressed, and highly affected by

even limited exposure to gendered stereotypes. Efforts to make STEM more attractive to girls by tying science to traditional girls toys and media may run into some of the same problems described by Orenstein. To make sense of this issue, one needs to engage the literature that suggests STEM representation in children's media has long neglected females and has perpetuated harmful stereotypes even in some of the best intended and executed efforts.

Content analysis generally finds that male scientists are more prevalent in portrayals of scientists across programs popular with adolescents (Long et al., 2010; Ryan & Steinke, 2010), and across science education television shows for children (Long, Boriarksy, & Thayer, 2001). Given the prevalence of men versus women on screen, the findings are not surprising. Additionally, nearly 75% of characters are white, which is problematic from an intersectional perspective (Ryan & Steinke, 2010). More promisingly, male and female scientists "were equally likely to be shown in high-status scientific positions," be married, not have children and be shown to be intelligent (Ryan & Steinke, 2010, p. 46).

Additional research indicates that there might be a long term effect in portrayals of scientists as men. The classic Draw-A-Scientist Test (DAST) has historically been employed to test the effect of media stereotyping of scientists on children. Chambers (1983) notably found that when over 4,000 elementary school children were asked to draw a scientist, only twenty-eight drew women (Chambers, 1983). Similarly, Fort and Varney (1989)'s study discovered that in 1,6000 drawings of scientists in their study, only 14 percent of girls drew women, and the number dropped six points for boys. Steinke et al. (2007)'s results more than 20 years later offered a somewhat more hopeful picture. Employing the same kind of test, they placed 319 participants in one of two intervention groups, discussion only and discussion plus video, or a control group. After the group sessions, participants were given a questionnaire asking them to

draw a scientist and then explain why they decided to depict the scientist like they did. What they found was that “boys are more likely than girls to draw male scientists, and girls were more likely than boys to draw female scientists” (p. 35). Their findings reflected a shift from previous DAST research in that in the past girls were more likely to draw male scientists. This finding may reflect a bump in female representation in STEM related media.

Media use may also skew views of women in science by confirming certain kinds of stereotypes. In *Toys and Tools in Pink: Cultural Narratives of Gender, Science, and Technology*, Carol Colatrella (2011) analyzed women in STEM across media platforms. Colatrella examines such texts as *Frankenstein* by Mary Shelley, the television show *Home Improvement*, and *Ahab's Wife* by Jeter Naslund, finding that women in STEM are represented as criminals, detectives, mothers, and babe (sexualized) scientists. In general, across genres and character types, Colatrella found that female scientists mainly enforced gender stereotypes but also had moments of subversion, many with characters who are scientifically adept but socially stunted or outcast. Babe scientists tended to be limited to secondary roles, have a physical or emotional health issue, and were involved in a romance plot. While female scientists in children's media tend to be scientifically competent, self-reliant, and brave, it does not stop instances where females interacting with science can be framed as destructive or childish (Colatrella, 2010). Although Colatrella analyzes some media that could be considered to shape girl culture, many of her texts are either intended for older audiences or more general audiences. In response, my thesis aims to expand this kind of critical analysis by exploring the neoliberal postfeminist messaging of brand products intended to promote STEM. While media representation of girls and women in STEM may be linked to efforts to patch the leaky pipeline, I suggest that their recycling of old

stereotypes reinforces the problematic postfeminist messages so many kids shows and movies try to promote.

Neoliberal Postfeminist Girl Culture

Although neoliberalism, postfeminism, and girl culture may be discussed as separate constructs, I will primarily focus on the concepts and values of where the terms intersect. By viewing them together, I aim to clarify the ways these constructs influence each other to create a larger cultural framework that affects women and girls. As such, it is the goal of my analysis to show how this larger cultural framework influences STEM representation in girl branded media.

Feminist scholars, such as Angela McRobbie (2004) and Mary Douglas Vavrus (2000), have discussed women and girl culture in terms of postfeminist messaging. While their accounts focus on 1990s media such as *Bridget Jones Diary* (McRobbie, 2004) and *Ally McBeal* (Vavrus, 2000), their work provides a useful foundation for defining postfeminism in terms of media. McRobbie (2004) characterizes postfeminism in terms of female success in which “feminism is acknowledged” and “taken into account” while simultaneously taking a “vehemently denunciatory stance” towards feminism (p. 257). In other words, while postfeminism gives a nod to feminism it does it in such a way that ultimately undermines feminist messaging. For example, in *Bridget Jones’s Diary*, Bridget’s greatest concern is her ability to participate in heteronormativity or, colloquially, the white picket fence dream which undermines her portrayal as a liberated woman (McRobbie, 2004). Vavrus (2000) explains that this postfeminist perspective articulates the view point of “elite, white, straight, women” (p. 413). McRobbie (2004) emphasizes how moments that explicitly objectify women do so in terms of autonomy, which refers to how a person is enabled or constricted by choice, empowerment, and voice to act. In many ways, postfeminism articulates how women should enact their new-found choice,

empowerment and voice (McRobbie, 2004). This idea has led to arguments for reconceiving how autonomy is discussed in studies of female characters, especially young women and girls, in terms of the emerging and complex postfeminist, post-girl power, neoliberal culture (Gonick, Renold, Ringrose, & Weems, 2009; Harris & Dobson, 2015).

Based on Gonick et al. (2009), Harris and Dobson (2015) argue that when enacting choice, embodying empowerment, and using voice, today's young women and girl characters are often fraught with contradiction. In fact, articulating victimhood becomes difficult to do without undermining one's innate power. Therefore, Harris and Dobson (2015) propose the use of the term "suffering actor" to better conceptualize the simultaneous victimization and agency that has been previously framed as a dichotomy (p. 153). This concept is useful for this particular study as postfeminism is thought to be fraught with contradiction (McRobbie, 2004). Another emerging definition comes from Kearney (2015), who examines the concept of sparkle as an aesthetic that conveys a post-girl power, neoliberal, and postfeminist agency that can simultaneously enact and subvert culture. These postfeminist terms are useful when considering how they relate to the creation of girl culture in relation to neoliberal capitalism.

Catherine Rottenberg (2014) defines neoliberalism as "a dominant political rationality" that also works to create subjects by "normatively constructing and interpolating individuals as entrepreneurial actors" (p. 420). In other words, neoliberalism functions as a political position that simultaneously promotes free-market capitalism and addresses subjects as individual generators of capital. As such, similar to postfeminism, neoliberalism can be seen as promoting the agency of the individual to act on their own behalf via participation in the market. In an article for *The Guardian*, philosophy and politics professor Nancy Fraser (2013) argues that the rhetoric of neoliberal feminism developed from "the feminist critique of the family wage" (para.

7), “the feminist turn to identity politics” (para. 8), and “the critique of welfare-state paternalism” (para. 9). These elements can be easily translated into the underlying principle of neoliberal feminism: female wage earner, individual responsibility, and female entrepreneur.

Valerie Walkerdine (1997) described girl culture as containing aspirations of glamour and stardom which were inherently linked to the practices of singing and dancing, and Anita Harris (2004) demonstrates how these ideals easily promote postfeminist neoliberalism in girl culture. Essentially, Harris (2004) argues that the nature of girl culture makes girls ideal consumer citizens who enact their citizenship rights via consumption. Sarah Banet-Weiser (2012) expands on this concept by defining brand culture as shaping “political, cultural, and civic practices” (p. 11); these cultural spaces are generally thought of as authentic, but now “authentic” has been branded. In her book *Authentic*, Banet-Weiser (2012) details the branding of consumer citizens, the postfeminist self, creativity, politics, and religion.

For this study, I will focus on the branding of consumer citizens and postfeminism. Banet-Weiser (2012) examines an element of commodity activism that she refers to as commodity feminism that is defined as “feminist ideals such as self-empowerment and agency are attached to products as a selling point” (p. 19). Thus, buying the product creates a false sense of empowerment that focuses on postfeminist ideals of individual, not collective, action and is a way of making consumers feel like they are working toward cultural change with their purchases. Additionally, Banet-Weiser (2012) discusses the notion of self-branding via the internet and social media platforms. In particular, the self-brand is a way of enacting brand culture, as one’s identity becomes tied up in the lexicon of business. More recently, Banet-Weiser’s concept of the self-brand has been applied to fashion blogging (Duffy & Hund, 2015; Marwick, 2013), as well as an anniversary Doctor Who fandom event (Hills, 2015). As such, the

exact implications of brand culture on feminine toy brands, and their corresponding media, selling STEM has yet to be explored, and the rest of this thesis will do so over three case studies using close textual analysis.

Chapter Outline

In the following study, I will explore the promotion of STEM culture through media surrounding the brand product lines of three major girl culture brands: Disney, Hasbro and Mattel. Specifically, each text will be analyzed through close textual analysis to determine: first, how STEM practices depicted in girl media tend to reinforce traditional gender roles; and secondly, how neoliberal postfeminist ideals influence the messaging about STEM in girl media that aims to patch the leaky pipeline. While each text demonstrates these aspects to varying degrees, each chapter will highlight a specific aspect of my broader argument.

In Chapter 1, I analyze the Disney Fairies screen media, which includes six movies and one TV special. The line focuses on Tinker Bell and her fairy friends who live in Never Land and use their magical skills to build, observe, and experiment. Each film relates to STEM skills in some way, but with a magical twist. In this chapter, I argue that the depictions of STEM work to reinforce traditional gender roles, such as using the aesthetic of sparkle to portray pretend STEM practices over real STEM. In addition, the portrayals support the basis of gender roles in white hegemony in relation to STEM and bolster popular beauty standards with STEM. Secondly, the films promote neoliberal market ideals regarding technology and industrialization in ways that erase the labor and environmental consequences of such processes.

In Chapter 2, I analyze Barbie's latest serial series on Netflix *Barbie: Dreamhouse Adventures*, which has 26 episodes over 3 seasons and focuses on sixteen-year-old Barbie and friends. Barbie and her family have just moved into their Dreamhouse that has been designed by

her mother, a computer programmer. Each episode follows the adventures of Barbie, her sisters, and her friends as they go about their extraordinary lives filled with crazy adventures and mishaps. As such, STEM activity and references appear throughout the show, but are not highlighted as teaching moments. In this chapter, I argue *Dreamhouse Adventures* continues a long tradition of the Barbie brand inherently undermining their attempts at STEM promotion. In this case, the show promotes traditional gender roles by feminizing STEM, portraying girls and women as incompetent at STEM, and showing girls utilizing false STEM concepts so it is more like play than the actual practice of STEM work. Moreover, the show promotes neoliberal values via the portrayal of capitalistic values of surveillance, the depiction of STEM in terms of consumerism, and the characterization of STEM in terms of entrepreneurship.

In Chapter 3, I analyze media content from *My Little Pony Equestria Girls*, which consists of five films, multiple television specials, a couple of webisodes from YouTube and a book. As *Equestria Girls* takes place in a parallel human-esque universe, science concepts seem more readily pursued. Each text alternates between main characters, some focus on Twilight Sparkle or her human-esque world counterpart of the same name, who is known for her interest in science and distinguished from pony Twilight by her glasses. Other episodes focus on Sunset Shimmer, who has also been shown in scientific pursuits (My Little Pony, n.d.). In this chapter, I explore how *Equestria Girls*, similar to *Dreamhouse Adventures*, reinforces traditional gender roles by linking STEM with feminine pursuits, portraying girls in STEM as dangerous, and depicting girls playing at STEM rather than actually practicing real-life STEM. Secondly, *Equestria Girls* media portrays neoliberal values in terms of the use of STEM technology for ruthless personal advancement and materialism.

Through these three case studies, I hope to call attention to the underlying ideologies of STEM promotion with regards to gender norms and intersectional identities. In particular, in relation to girl culture and critical feminist studies, I intend to demonstrate how STEM portrayal in branded media is linked to traditional gender roles and neoliberal values in such a way that ultimately reinforces the leaky pipeline instead of fixing it.

Chapter 1

Disney Fairies and the Disney Brand of STEM

In a nursery in Victorian England, a baby laughs for the first time. The laugh is carried on a dandelion seed to a giant tree in Neverland where under a sparkly waterfall of pixie dust the emblematic fairy Tinker Bell takes form. Thus begins the 2008 premiere feature film, *Tinker Bell*, the newest media addition to Disney's Fairies franchise. The film focused on Disney icon, Tinker Bell, and her new fairy friends who live in Pixie Hollow, a part of Neverland, where they work year-round to make sure the seasons change. This franchise would soon merit five more films and a television special, not to mention the books that came before the videos. A major feature of these stories is that the fairies utilize the science, technology, engineering, and math (STEM) fields, with just a little bit of pixie dust, to drive the annual cycles. One reviewer describes Tinker Bell as having a "keen grasp of kinematics, thermodynamics, materials science and structural analysis" and points out that instead of fighting "Tink [draws] up blueprints" (Wyles, 2015, para. 5-8). Although the sequels generally focus less on Tink, they continue the long Disney tradition of mixing magic and STEM.

Walt Disney used the term "edutainment" to describe his television and films that mixed STEM and magic, representing media that was meant to mix education with entertainment in hopes of making learning fun (Van Riper, 2011). In World War II, edutainment films were used to teach the troops basic army training from personal hygiene to the use of anti-tank weapons (Van Riper, 2011). Disney even created a televised series to promote Disneyland, which featured many short edutainment films (Mechling & Mechling, 1995). In the business world, this type of cross-promotion is known as "Disney synergy," which connotes "the ultimate in cross-promotional activities" (Wasko, 2001, p. 71). However, many of these films problematized their

factual teaching by mixing magic and other fantastical features into their films (Norden, 2011; Van Riper, 2011). Today, while edutainment films still exist, the Disney Fairies franchise glibly uses magic to explain things, overriding accepted scientific knowledge and taking the conflation of science and fantasy to a new level. I argue this move away from scientific facts is a result of the target audience and market forces, meaning that the company's goals of bringing edutainment to young girls puts the entertainment ahead of education. More specifically, I suggest that Disney undermines its STEM messaging by producing messaging that reinforces traditional gender roles through neoliberal postfeminist rhetoric and reinforces consumer culture via the industrialization of pixie hollow.

This chapter develops over several sections. First, I will define the Disney Brand to illustrate how its brand culture influences its decisions regarding Disney Fairies throughout. Second, I explore Disney's Edutainment to note what has developed as the brand standard and how Disney Fairies compares. Third, I place the production of the Disney Fairies films in a larger cultural context, and discuss how the films use neoliberal postfeminist messaging to reinforce traditional gender roles and neoliberal capitalist consumer culture. I end the chapter by discussing the implications for the larger argument of this thesis.

The Disney Brand

The word "Disney" has become a metonymy for wholesome, nostalgic, family friendly entertainment that takes its consumers on exciting adventures in visually stunning magical realms. In fact, Disney has been considered a "mecca" for middle class American (Wills, 2017, p. 6). The Disney company has worked hard to make this association dominant not only with its marketing efforts such as "the happiest place on earth" but also with the content of its films for

children (Giroux, 1999; Wasko, 2001). With this in mind, in this section, I provide an overview of the Disney brand and how it relates to its business model.

For Walt Disney, the narrative arc of Lewis Carroll's *Alice in Wonderland* embodied his desire to envelop all of his customers in a world full of whimsy and wonder (Norden, 2011). In fact, American cultural historian, John Wills (2017) defines Disney Culture as "the assimilation of other stories and ideas...to impart a range of traditional and progressive values" (p. 4). In other words, the Disney company largely draws its children's film materials from stories across the globe that are then shaped to reflect Disney values. These stories often help spread the Alice-in-Wonderland goal. As such, we can understand why similar narrative arcs permeate old and new Disney films including an animated telling of *Alice in Wonderland* (1951), live action films such as *Mary Poppins* (1964) and *Mary Poppins Returns* (2018), and other fully animated features such as *Peter Pan* (1953), *Atlantis: The Lost Empire* (2001), and *Coco* (2017). Thus, the Alice-in-Wonderland narrative arc is a foundational narrative in the creation of the Disney brand as magical and imaginative. It is a part of the Disney values that the company uses to reframe its stories. It also centers the figure of the innocent child as the main character exploring this manufactured world of whimsy. Most of Disney's children's films are set in the past, creating a nostalgia for times gone by that also never actually existed. Additionally, the company capitalizes on and lauds nostalgia for childhood in updating its most treasured classics such as *Beauty and the Beast* for contemporary sentiments with live action or live action looking productions.

Education and culture scholar Henry Giroux (1999) argues in his book, *The Mouse that Roared: Disney and the End of Innocence*, that Disney hides its market controlling nature and cut-throat business practices behind its innocent, nostalgic, and magical brand. The average

audience member bemused by a Disney film would not suspect a larger politically influenced economic agenda is being pushed within the films. Giroux (1999) connects his argument to how, from the time of Walt, the Disney company has acknowledged that popular culture educates children to proper conduct in society. This acknowledgement creates an inherent contradiction as “education is never innocent” because it always comes from a particular viewpoint (Giroux, 1999, p. 31). Nevertheless, Disney sells its products as if they were untouched by political and historical context. For example, when Disney acquired ABC and its news network, ABC News was no longer allowed to run stories critical of the Walt Disney Company (Giroux, 1999). This was demonstrated in 1998, two years after Disney acquired ABC, when David Westin, ABC News president, put a stop to a *20/20* news story about the book, *Disney: The Mouse Betrayed*, by Peter and Rochelle Schweizer (Giroux, 1999). Disney also indoctrinates employees into certain standards of behavior and dress, creating strict guidelines that promote a work culture of strict surveillance, which means employees can be fired for the slightest infractions. They use catchy phrasing to drill in proper work procedures. In the late 1960s, Van Maanen (1991) was dismissed for having his hair brushing his ears. The process was also made very public to instill fear of dissent in other employees. He was ushered away from his station during working hours and then had his now invalidated punch card left on display in the clock-in room (Van Maanen, 1991). Despite these criticisms, Disney is “a model of successful entertainment capitalism” (Wills, 2017, p. 77). The Disney company holds seminars to teach others their management processes and several books have been written on the subject including *The Disney Way: Harnessing the Management Secrets of Disney in Your Company* by Bill Capodagli and Lynn Jackson (2007) and *Inside the Magic Kingdom: Seven Keys to Disney’s Success* by Tom Connellan (2008). These works support Alan Bryman’s (1999; 2004) concept of Disneyization

which considers how Disney's corporate practices have come to define and influence other sectors of society.

There are many more examples of Disney's aim to dominate markets with its brand. For example, the company also distributes its films in such a way that forces theaters to accept a package deal rather than individual films, which could endanger the movie theater if even one of the films they are forced to accept is not a hit. Wills (2017) argues that Disney expertly capitalizes on consumer culture in every facet of their business. In particular, their parks function as elaborate shopping malls for Disney, with mainstreet as the main shop thorough fair, however, each ride ends in a gift shop and every area has its own special themed restaurants (Wills, 2017). Thus, Wills (2017) supports Giroux's (1999) argument that Disney's calculated corporate practices are very different from the fantasies of corporate utopia created via its parks and other endeavors which it envelops in innocence and nostalgia.

In her book, *Understanding Disney: The Manufacture of Fantasy*, communication scholar Janet Wasko (2001) describes the political economy that fuels the Disney media machine. Specifically, Wasko (2001) describes how Disney uses the concept of corporate synergy to market and build its brand through its media empire. For decades, Disney has thrived and expanded under this synergistic model of business. Disney uses the full force of their media conglomerate to cross-promote their franchises with special synergy managers for every department from books to radio stations to toys (Wasko, 2001). For example, when the live action Cinderella was about to be released in 2015, the franchise cross promoted the film with a special Cinderella date episode featured on Disney owned ABC's *The Bachelor*. In another example from 2015, Disney used a dark version of the song "I've Got No Strings" from *Pinocchio* (1940) to promote the Disney Marvel movie *Avengers: Age of Ultron*, which was the

same year of *Pinocchio*'s 75th anniversary as a Disney film. Another major aspect of Disney's synergistic practices is its early adoption of licensing of the Mickey Mouse image for the use on handkerchiefs to watches, a practice that kept the studio from bankruptcy in the early days (Wills, 2017). Realizing the importance of licensing, Disney was the only production company to constantly push its bounds, and licensing continues today to be a major arm of the Disney conglomerate (Wills, 2017). These highly calculated cross-promotional activities are prime examples of Disney synergy. In the next section, I will explore how Disney's synergistic brand and business practices are illustrated in Disney's endeavors in educational media since World War II. In other words, with companies like Disney, the effort to educate is always tied to an effort to expand an entertainment brand, which leads to messages that blend the citizen and the consumer, the educated and the indoctrinated.

Disney's Edutainment

When the US entered World War II at the end of 1941, Disney quickly became the largest producer of propaganda and troop education films, dedicating over 90% of Disney's 300 employees to the job (LIFE Magazine, 1941). In total, Disney generated over 68 hours of WWII material (Gavin, 2017). In 1943, Disney produced 94% of their government contracted material at cost (Churchill, 1945). This marked Disney's first major foray into what Walt Disney in 1948 would call "edutainment," defined as "films designed to educate as well as entertain" (Van Riper, 2011, p. 2). Disney's next popular edutainment series was made from 1948-1960. Called *True-Life Adventures*, the series consisted of highly anthropomorphized short narrative films designed to teach animal behavior but undermined this goal by ascribing human-like characteristics to the various wildlife (Van Riper, 2011). In 1954, coinciding with the opening of Disneyland, a *Disneyland* television series began playing on ABC each week featuring a segment

thematically related to one of the park's four main sections: Fantasyland, Frontierland, Adventureland, or Tomorrowland (Mechling & Mechling, 1995). The Tomorrowland segments featured the most science related content. One notable original production for Tomorrowland was a short film called "Our Friend the Atom," which aired in 1957 (Mechling & Mechling, 1995).

As a cultural product, "Our Friend the Atom" is a quintessential example of the Disney brand and its relationship with science. After the horror of dropping atomic bombs on Hiroshima and Nagasaki, and under the Cold War shadow of the USSR and other nations developing nuclear weapons programs, this film was part of a widespread effort to make atomic energy seem friendly. President Eisenhower called this effort "Atoms for Peace" (Mechling & Mechling, 1995, p. 441). In the film Disney uses "The Fisherman and the Genie" from *The Arabian Nights* as a metaphor for harnessing atomic energy. The genie, a powerful magical being, represents the atom, thus exemplifying how Disney products often conflate magic with STEM (Mechling & Mechling, 1995). "Our Friend the Atom" is also a crucial example of Disney using their family friendly, seemingly innocent, brand to smooth over the dangers of atomic energy, similar to Henry Giroux's (1999) argument. The short film is also a great example of the marketing and brand building synergy that dominates Disney culture (Wasko, 2001). Not only was the program already a tie-in to promoting Disneyland, but it was promoted with a widespread advertising campaign, tied-in to a book published by Simon & Schuster, and supplemented by educational materials for elementary and secondary school students (Mechling & Mechling, 1995).

Another example of Disney's early edutainment efforts that conflated magic and science while building the larger brand is the 1959 featurette *Donald in Mathmagic Land*, which debuted with an accompanying comic strip by Dell (Norden, 2011). The featurette is the perfect

embodiment of the war time principles the studio had learned. Three striking characteristics were that the film used an inexpensive production style, an Alice-in-Wonderland narrative arc, and an authoritative male narrator to teach a Disney icon pupil, Donald Duck (Norden, 2011). The male narrator became a staple for presenting Disney's scientific authority which reinforced a Disney stereotype of the man/father/king as the authority figure (Norden, 2011). While the film explains real mathematical principles, it does so in a world full of weird pencil beasts, trees with square roots, and odd geometric creatures; a world that magically jumps scenes and blends cartoons with live action. Thus, the line between the magical and mathematical is blurred, and the brand is foregrounded in the educational message.

Today, while Disney still produces content for classrooms such as Disneynature films, they also have started specifically targeting STEM content to young girls (ages 6+) with the Disney Fairies film series. These films exist to address what many scholars call "The Leaky Pipeline," a metaphor which refers to women dropping out of STEM due to various gender and age-related social pressures (Colatrella, 2011).

The Cultural Context of Disney Fairies

In 2005, Disney put the full force of their synergistic power behind its new line, Disney Fairies, with the launch of Gail Carson Levine's book *Fairy Dust and the Quest for the Egg* aimed at pre-tweens, girls ages 6-10 (McClintock, 2014; Petrecca, 2005). The franchise stems from the already popular Disney icon, Tinker Bell, who has remained highly visible since her 1953 debut in Disney's *Peter Pan*. Not only does she spread magic over the Walt Disney logo, and start the fireworks from a guy-wire in the parks, but her likeness has been festooned on numerous commercial products from watches to bath mats, earning Disney \$400 million annually (Orenstein, 2006). Tinker Bell was even briefly a part of the Disney Princess line

(Orenstein, 2011). Playmates' toys were officially announced as the producers for the new Disney Fairies toy line at a time when Tinker Bell had a 90% brand awareness with girls ages 6-11 and a 96% brand awareness with moms of 2 to 5-year-olds (Disney Consumer Products, 2005). In 2009, Tinker Bell was named the United Nations Honorary Ambassador of Green as an icon supporting environmental efforts (UN News, 2009). As of 2014, the Disney Fairies franchise is worth \$300 million. While significantly less valued than the Disney Princess franchise (\$3 billion), it was an outstanding sum for a fairly new line that produced films that have mostly been released direct-to-DVD (McClintock, 2014).

The Disney Fairies' films kicked off in 2008 with *Tinker Bell*, which was followed by *Tinker Bell and the Lost Treasure* (2009), *Tinker Bell and the Great Fairy Rescue* (2010), *Pixie Hollow Games* (a 20 minute television special), *Secret of the Wings* (2012), *The Pirate Fairy* (2014), and *Tinker Bell and the Legend of the Neverbeast* (2014), each running about 80 minutes. The main characters consist of Tinker Bell and her friends: Silvermist, an Asian water fairy; Iridessa, a black light fairy; Flora, a white flower fairy; Fawn, a white animal fairy; and Vidia, a wind fairy of indeterminate ethnicity/race. Each film features Tinker Bell or one of her fairy friends as they embark on STEM motivated adventures. The Disney Fairies' films have reached about 30 million viewers, and the Pixie Hollow website was visited by approximately 20 million girls each year when the website was live (Meyers, McKnight, & Krabbenhoft, 2014). Today, while certain aspects of the franchise have been discontinued such as the films and the website, the franchise is still available via online games, internet streaming, books, DVDs, and merchandising (Gumeny, 2018; Meyers et al., 2014).

Despite the films' obvious STEM messaging, the creators and critics mostly talk of the franchise as generally empowering to girls and entertainingly celebrating magic. Bradley

Raymond, director of *Tinker Bell* and *Tinker Bell and the Great Fairy Rescue*, described the films in terms of “wish fulfillments” for elementary aged girls with the creation of a “magical world” in which the “magic of nature” turns out not to be natural processes as science understands them (Cedeno, 2010, para. 10-18). Peggy Holmes, director of *Secret of the Wings* and *The Pirate Fairy*, relates how audiences “love the fairies because they have power and talents” and that “the fairies are superheroes to them” (McClintock, 2014). One critic did describe Tinker Bell as “something of a scientist,” which implies perceiving a kind of amateurism in how Tink practices science (Osmond, 2010, para. 1). However, Liza Wyles (2015) of *The Mary Sue*, a feminist online magazine, lauded Tinker Bell as a STEM icon who had the potential to positively influence girls. Yet, for the most part, there have been few critical mentions of how STEM is represented in this content.

The Problematic Messaging of Disney Fairies Features

Disney’s STEM edutainment is attempting to address the shifting market values of neoliberal postfeminism and girl culture. However, this messaging becomes problematic because it ultimately undermines any aspirations parents might buy into. This messaging reinforces normative gender roles, conflates STEM with magic, and reflects neoliberal capitalistic practices in the industrialization of pixie hollow. In fact, rather than producing liberatory content, Disney is reinforcing the structure of the pipeline and the very leaks which it purports to be fixing. In so doing, Disney is also participating in the creation of the consumer citizen. As such, in the following section, I will examine the problematic messaging of the Disney Fairies films in depth. The Disney Fairies films consist of six films, about 80 minutes each and one 20 minute television short. For this analysis, I deviate slightly from the three-point structure as the

following sections on the reinforcement of traditional gender roles and the neoliberal market values amply covers the topics discussed.

Traditional Gender Roles

Above all, the Disney Fairies films support hegemonic values of traditional gender roles. As I discuss in this section, these hegemonic traditional gender roles are characterized by a white normative standard of female roles as passive laborers and objects for viewing (England et al., 2011; Kearney, 2015). The films do this by associating science with sparkle and play, rather than actual scientific facts. Additionally, they show mainly white men and white women as practicing STEM which reinforces the hegemonic position of white people across genders. Finally, the films present traditional messaging regarding female beauty standards.

Pixie Hollow is overflowing with sparkle from pixie dust, which feminist media scholar, Mary Celeste Kearney (2015) has described as a postfeminist phenomenon in girl culture that is primarily targeted to and enacted by “white middle-class female youth” via their consumption of sparkly “makeup, clothing and accessories” (p. 263). As such, Kearney (2015) is describing a neoliberal postfeminist practice of enacting identity through consumption as argued by Banet-Weiser (2012). Thus, Disney Fairies use of sparkle promotes consumerism, which is a key part of the traditional role of women and girls as shoppers. Kearney (2015) goes on to describe how this use of sparkle in Disney media often stands for the positive “channeling of supernatural power” (p. 268). Thus, while the use of pixie dust is a way for the fairies to enact power it also makes all the fairies’ STEM practices less scientific and more magical. This marks a departure from previous Disney edutainment which at least attempted to convey some accurate scientific knowledge (Mechling & Mechling, 1995). In addition, it reinforces traditional gender roles

because it promotes the idea that women and girls can play at science rather than do actual science.

Throughout the films, there are many examples of the fairies using pixie dust to conduct STEM endeavors. For example, in *The Pirate Fairy*, Zarina manipulates pixie dust so that different colors of dust emulate each of the fairy types' specific powers. Basically, rather than practicing chemistry with known elements and substances, Zarina is manipulating visually sparkly magic (Holmes, 2014). In fact, rather than promoting any real type of scientific knowledge, Zarina works to replicate a sparkly aesthetic that is linked with white girl culture consumption of sparkly products (Kearney, 2015). Thus, the practice of STEM is translated into something young girls and women can only play at or mimic through their choices of consumption. Essentially, it is saying that when women use science, it is not to solve real life issues that can transform the world, but to practice a fun hobby merely for personal enjoyment. Tinker Bell's mechanical engineering creations are essentially a mix of the practical and the magical. This means some of her inventiveness is a positive portrayal of impactful work. However, much of her work is undermined by being magical and thus not scientific, which again plays into girls lack aptitude in science fields. For example, in *Tinker Bell*, Tink repairs a human music box with gears to play the music and rotate the ballerina on top of the box (Raymond, 2008). Tink's skill reproduces popular imagery of girl culture, the ballerina music box, rather than a more innovative product. In *Lost Treasure*, Tinker Bell is commissioned to build the Harvest Scepter for the Blue Harvest Moon. The scepter will hold the light refracting moonstone to channel moonlight to create blue pixie dust. The blue pixie dust is then used to replenish the Pixie Dust Tree's supply of pixie dust for another year (Hall, 2009). Once again, Tink has been commissioned to design a product that demonstrates Kearney's (2015) definition of the sparkly

aesthetic. While this sparkly aesthetic is about producing power for the fairies, it also reproduces the association of glitter with girl culture. In girl culture, while glitter can be subversive, it can also reinforce the idea that things for girls are meant to be eye catching as girls in general are meant to be eye catching (Kearney, 2015; Mulvey, 1988; Walkerdine, 1997). Thus, ultimately reinforcing traditional middle to upper class gender expectations for women and girls. In this same film, Tink creates a blimp-like craft that runs on pixie dust (Hall, 2009). This reinforces the idea that technology engineered by girls or women can only work by magic. Thus, in reality, women and girls are not capable of creating working machinery, but instead playing and pretending to be equal contributors in society. In *Great Fairy Rescue*, the conflation of pixie dust and science becomes very clear in an interaction between Tink and the human Lizzy. Lizzy says, “I had no idea fairies were responsible for changing the seasons. I thought it had something to do with the earth's axis as it rotated around the sun.” Tink promptly replies, “That’s what we wanted you to think” (Raymond, 2010). In the same film, Lizzy insists to her father that fairies paint butterflies, and then is actually able to prove herself correct to her father (Raymond, 2010). By conveying these ideas through a little girl like Lizzy, whom the target audience is most likely to identify closely with as they are young white girls themselves, Disney promotes the idea that girls should not believe in or participate in actual scientific thought or endeavor. This idea plays to the normative female gender roles in that women are expected to be passive, rather than active, participants in society (England et al., 2011).

Not only are the fairies’ STEM practices undermined by pixie dust, but Tinker Bell’s creations are often shown as dangerous. In *Tinker Bell*, Tink tries to create helpful inventions for the fairies’ trip to the main land to change the seasons. Unfortunately, her invention, a nut cracker, the nut ends up hitting a squirrel in the face and making it cry. Her next invention, a

sprayer to help paint flowers, also goes awry and sprays too much paint everywhere (Raymond, 2008). While her later inventions in the film are shown to be useful, Tink still has troubles with her creations. In *Lost Treasure*, Tink starts the film working on a “motor” boat, the motor is made from folded cards and rubber bands, to help the dust fairies make their deliveries. As she is testing the boat out, it starts to go much faster than she anticipated. The boat only stops when it crashes into a tree (Hall, 2009). In *Great Fairy Rescue*, Tink fashions a complicated mechanism in the human’s attic to direct rainwater out of the house. Her work ends up being a precarious looking system made from objects scattered around the attic. While this is helpful and shows positive ingenuity, it is not as practical or sustainable as actually fixing the leaky roof (Raymond, 2010). This scene reinforce traditional ideas about how girls and women are incapable of making rational decisions. Finally, in *Secret of Wings*, Tinker Bell invents a machine to create fake snow, which is impactful enough to create a dangerous frost that puts the trees and fairies of Pixie Hollow in danger of freezing to death (Gannaway & Holmes, 2012). The tiny invention ought not be able to cause such a widespread freeze that is “magically” dangerous. Perhaps some of this representation could be remedied if the films made more of a point to obviously connect Tink’s prototypes to actual finished products that do occasionally show up in later films. For example, Tink’s ice machine works perfectly at a pixie gathering early in *The Pirate Fairy*, yet no comment is made to connect the previously disastrous machine and the newly function mechanism (Holmes, 2014). Since this connection remains unclear, Tink’s engineering problems reinforce a TV trope that women who practice STEM are dangerous (Colatrella, 2011). The use of this trope reinforces traditional gender roles because the idea that women are dangerous in science strengthens the idea that traditionally women do not belong in the sciences. Perhaps some of this representation could be remedied if the films made more of a point to obviously

connect Tink's prototypes to actual finished products that do occasionally show up in later films. For example, Tink's ice machine works perfectly at a pixie gathering early in *The Pirate Fairy* (Holmes, 2014).

Further reinforcing the idea that women are not needed in STEM, while Tinker Bell and the other tinker fairies are portrayed as interested in science, they are still in need of male counterparts to make it work; in essence, the films further portray science as a male's trade. Aside from Tinker Bell, there are fewer representations of female tinker fairies. In fact, the only other prominent female tinker fairy is Fairy Mary, who is in charge of all the tinkers. Whilst she is in a position of power, Fairy Mary rarely does anything STEM-like except her use of an abacus, which does not look adequate to the job. She appears as if she is just posing with it and pretending to calculate with it. In essence, Fairy Mary appears scientific, but seems clueless about her trade (Raymond, 2008). Otherwise, the only tinker fairies the audience gets to know are Tink's friends, Clank and Bobble, two white male fairies of geeky appearance. The limited number of women Tinker Bell interacts with in her own fairy class is indicative of mechanical engineering still being a field unfriendly to females. Even the chemist-like fairy, Zarina, is surrounded by male pirates in her endeavor to create pixie dust (Holmes, 2014). Thus, as a whole these examples portray messaging that girls and women are not really meant to be in STEM. It is only the exceptional few that can make it into STEM.

Another issue with the films is who is being represented as participating in STEM-like activities which detracts from any positive feminist messaging. Every film focuses on a white fairy or person. Since white male and female fairies or people are solely shown participating in STEM, it reinforces the idea that normative gender roles are based on white society. In the first two films, Tinker Bell designs and creates things from new clothes to a flying blimp-esque

vehicle. In the third film, *Great Fairy Rescue*, the white human girl Lizzy, whose father is a naturalist, practices naturalistic field-type research on fairies with Tinker Bell's help (Raymond, 2010). In *Secret of the Wings*, Tinker Bell's machine creates dangerous weather for Pixie Hollow (Gannaway & Holmes, 2012). In *The Pirate Fairy*, Zarina, a white dust fairy, performs chemistry-like experiments on pixie dust (Holmes, 2014). Finally, in *Neverbeast*, the white animal fairy, Fawn, does naturalistic studies by observing the behavior of the magical Neverbeast (Loter, 2014). Thus, the token diverse characters are not centrally featured in the films nor do they perform any STEM-like tasks. Clearly, this exposes a problematic normative precedent indicating who is truly being targeted: white 6 to 11-year-olds. This reinforces Vavrus (2000) who defines the neoliberal perspective as white and privileged. It also reinforces gender stereotypes because in the west normative gender roles are built around wealthy white people as the standard.

Finally, the films also lead to the idea of traditional gender roles for girls and women to conform to popular beauty standards. All of the main fairies are model thin, big eyed, unrealistically proportioned women, who have immaculate makeup and wear short skirted fashionable dresses, i.e., they are sexualized according to popular beauty standards. The fairies' body types reinforce negative beauty standards expected of women today. Only Silvermist has a longer skirt, only Vidia wears long pants, and only Tink's sister has leggings, while most of the female fairies wear sexy dresses. Their dress styles not only reinforce unrealistic beauty standards, but also provide style models of how young girls should dress as the primary consumers of such media. In fact, the films portray Tink designing her own clothes (Raymond, 2008). This not only reinforces the idea that girls should be concerned with fashion, but also promotes the idea that Tink is in some way owning her own sexiness, as she is the one to make

the clothes. This is problematic because Tinker Bell is an animated character, thus, it is hard to make the argument she has any control over her design. Overall, these sexy beauty standards should not be sold to elementary aged girls, as they are too young to be participating in dating culture. The fairies' style also implicitly promotes girl's and women's roles as looking sexy for an audience (Mulvey, 1988; Walkerdine, 1997). Furthermore, it is problematic because dresses are also a way of policing the movement of young girls, who are less likely to be active when wearing dresses and skirts (Mergler, 2017).

As a whole, the Fairies films promote a hegemonic view of traditional gender roles. They reinforce ideas that women should not participate in STEM by showing women playing at science and often failing at science. They show mainly white men and white women as tinker fairies, which completely leaves out diverse representation and reinforces the idea of white people being the ideal standard. Finally, the films reinforce constricting beauty standards in how the fairies look and dress. As a whole, these messages largely undermine any positive aspects of female representation the films may portray.

Neoliberal Market Values

As a monarchy, the pixie economic system centers on the norms of reciprocity. In this case, all labor is considered for the crown and everyone labors; thus, they all receive a scheduled allotment of pixie dust which helps the fairies fly and provides magic to perform their jobs. From birth to labor to compensation, the magic of pixie dust is everything in the fairy world. Disney uses the sparkle of pixie dust to create an instantly marketable aesthetic for any Disney Fairies branded products similar to the sparkly products Kearney (2011) describes. Pixie dust also creates a society ripe for industrialization much like the early 20th century that the series is shown to be set in. In the films, different parts of fairy society become more industrialized thanks

to Tinker Bell's inventions. This is problematic because the depiction of industrialization reinforces commodity fetishism, which is the Marxist idea that consumers have little to no idea of how and under what conditions the goods they buy are produced and erases the environmental issues of industrialization (Buchanan, 2010). As such, in this section I will analyze how the films relate messaging of industrialization conveyed through Tinker Bells' gadgets, Tink's fascination with human technology, and how her creation of assembly lines promotes problematic messaging regarding the nature of production. This fascination with technology and industrialization reflects basic tenets of neoliberal capitalist consumer culture. Overall, these depictions create unrealistic standards of actual working conditions in STEM, and most importantly naturalizes a sense of worker exploitation that may turn many girls and young women away from STEM fields when they find them incompatible with communal values.

In *Tinker Bell*, as Tink tries being different kinds of fairies, she summarily destroys all the fairies' preparations for spring. This drives the plot to the point where it is up to Tink's last minute inventions to help the fairies speed their production processes along. For example, Tink invents paint sprayers to cut down on the time it takes to paint an insect from 10-15 minutes to a minute at most. She also creates a vacuum-like machine to help pick up all the spilled food baskets (Raymond, 2008). Thus, the film conveys an inherently positive message about technological advancement. In the real world, the military industrial complex often creates what eventually becomes civilian technology. So, the idea of technology being absolutely value free and only useful is a type of neoliberal commodity fetishism of the actual processes that produce "advancement" in our society (Buchanan, 2010). As such, the film does not adequately address the moral implications of working in STEM. While it is important to encourage girls to pursue STEM careers, it is equally important to have them consider the implications of said careers.

Tinker Bell's creations erase the actual implications of production. In *Lost Treasure*, Tinker Bell works on a speed boat to help the dust fairies with their deliveries to river outposts and invents a blimp-like transportation machine. Since Tinker Bell uses recycled human materials, natural objects, and pixie dust to make her inventions work, none of her transportation devices come with the drawbacks of typical motorized vehicles, namely carbon emissions (Hall, 2009). Similarly, in *Great Fairy Rescue*, fairies use Tinker Bell's mechanized three loom weaving machine to create the plant Queen Anne's lace. Another fairy uses a bee-liner which is a gadget that quickly paints stripes on bees. This scene erases the inherent danger of working around mechanized means of production (Raymond, 2010). *Secret of Wings* is the only film that depicts one of Tink's inventions having a significant environmental impact. Her snow making machine makes all of Pixie Hollow very cold. However, the problem is shown to arise from the nature of the machine rather than a toxic byproduct of technology (Gannaway & Holmes, 2012). By not depicting a more realistic representation of factory processes, it gives young girls the idea that all technology is inherently safe.

Throughout the series, Tinker Bell is shown to have a fascination with human things, from the music box in the first film to car engines and light bulbs in the second, and more. Much of what Tink does in her inventions is translate these human mechanisms into fairy terms. For example, in *Great Fairy Rescue* we see Tink fascinated by a car's working engine and able to figure out how to best disrupt its mechanisms (Hall, 2009). In the television special following *Great Fairy Rescue*, *Pixie Hollow Games*, we see the fairies utilizing fairy adapted cars for racing (Raymond, 2011). This once again sanitizes human technology by eliminating the consequences of such technology. It also frames humans as these great inventors that pixie society can learn from to improve on their own primitive methods. Thus, the films parallel

messaging of colonialism where the more technologically advanced society insists they are improving a less technologically advanced society rather than systematically destroying a culture with their own (Scott, 2014). Rather than adopting messages that might be more feminine and inclusive, the films portray science as a masculine art of dominance, spreading the neoliberal message that those with power work for it, and are thus entitled to practice it over others. The science in Tink's world is value free, and implicitly praises those who benefit the most from material production. As such, girls are given a view to inherently support technology, rather than to take a more critical view of how technology influences everyday living standards.

Finally, pixie culture mimicking 20th century England can be seen in the creation of assembly lines across Pixie Hollow. In *Tinker Bell*, the Pixie Dust Tree produces a waterfall of pixie dust that pools in a central part of the tree's exterior. Dust is distributed via a line near the pool by a dust fairy with a spoon or by fairies simply flying through the waterfall of pixie dust (Raymond, 2008). However, in the next film, *Lost Treasure*, this process has become a mechanized production line. The pixie dust pool now drains into piping inside the tree that sends the dust to flower holders that dust fairies on an assembly line squeeze into bags made from grass or leaves. The full bags are then put on a giant honeycomb-looking machine that spins, like a dish return with shelves at a cafeteria, to the front office of the dust factory. There is even an alarm system consisting of bugs and flowers set up by the administrative assistant's desk to mark the end of a work period (Hall, 2009). The dust factory is also featured in *The Pirate Fairy* (Holmes, 2014). In *Great Fairy Rescue*, we see a vertical belt system with flowers being filled with some sort of liquid, presumably nectar. There is also a horizontal conveyor system that carries leaves full of food across the fairy tree camp (Raymond, 2010). In *Secret of Wings*, the summer fairies' goods are placed into baskets via conveyor belts which are then raised to be

picked up by snowy owls and taken to the Winter Woods (Gannaway & Holmes, 2012). Once again, these processes are devoid of all negative impacts. Once more, they practice commodity fetishism by not portraying the reality of most factory production lines, which are incredibly dangerous environments for workers, and are often depressing facilities that exploit their employees' labor with strict regulations on breaks and little pay (Buchanan, 2010). While it might be a tall order to have a children's show realistically deal with nuanced implications of STEM, it could at the very least explore either actual mechanical engineering for green technology or the industrial waste consequences of many mechanized processes. By avoiding the moral implications of STEM, the films replicate the market-based values of dominance and profit, working against the kind of inclusive culture that STEM fields sorely need but that Disney likely has no desire to create if it clashes with their capitalist agenda.

What is missing from the films further exemplifies the culture of exploitation that they promote. In the case of the fairies, they get to work in idyllic settings with the assurance they will receive their allotted amount of fairy dust, but that work seems to come at a price that is rarely acknowledged. The fairy land promotes worker exploitation especially because fairies are rarely shown participating in leisure activities. This reinforces the deceptive concept that work should be viewed as a type of leisure or simply a pleasant default activity of life. This false narrative encourages workers to work more, thus further contributing to commodity fetishism and the neoliberal ideas that the market is a positive social construct to participate in. For girls learning about STEM careers, the message could not be any clearer: to live is to labor happily. There is no depiction of the real implications of such labor such as reduced time for friends and family. There is no consideration for the real moral implications of working in STEM. The films imply that succumbing to the machines that laborers create and maintain is devoid of any real-world

impacts. For the many girls watching such messages, they inherently learn, true to the Disney way, that technology is good and consequence free. While it is good to try and get girls interested in STEM, it is dangerous to pedal consequence free technological labor as it encourages girls to be less critical.

Conclusion

Overall, the Disney Fairies series reinforces traditional gender roles and demonstrates neoliberal consumer messaging. Rather than have the fairies' STEM work be based in real science, it is mostly centered around the practice of magic. This inherently promotes the idea that girls and women should not actually be in STEM, but rather uphold more traditionally passive roles in society. The fairies are also often shown practicing STEM skills for the purposes of traditional female interests such as ballet and fashion. The stories also work to promote inherently positive messaging about technology in an industrialized world, neglecting to take seriously concerns that such consumer culture is incompatible with the lives that many women eventually want for themselves. This messaging erases any of the disastrous side effects perpetuated by neoliberal capitalistic consumer culture such as environmental pollution, worker exploitation, and rampant sexism that makes it difficult to be a woman in the workplace. It also erases the substandard working conditions of most people under an industrialized society.

Disney's portrayal of STEM in the Disney Fairies franchise reflects Disney's long standing tradition of using their innocent and family friendly brand image to cover up more insidious facets of messaging, a theme common in Disney edutainment. In this case, Disney is pushing a seemingly positive portrayal of women in STEM, but in reality it does not teach any actual math or science. Therefore, the Disney Fairies films ultimately fail to structurally reshape

the leaky pipeline, let alone patch it. The messaging of the films ultimately boosts Disney's profits but does little to promote social progress.

Disney Fairies films, taken as a whole, supports the production of similar feminine STEM toys and media within the established and controlled market. For example, a high percentage of "science" kits aimed at girls are to create some sort of body product, which exposes the marketing drive behind these products, thwarting any positive intent (MGA Entertainment, n.d.). In fact, these products reinforce stereotypical female gender roles of physical grooming and shopping (England et al., 2011). In chapter 3, I will analyze the Barbie screen series *Barbie Dream House Adventures*. I explore how the show, similar to Disney Fairies, uses concepts of STEM to reinforce traditional gender roles, hegemonic girl culture, and neoliberal ideas.

Chapter 2

Barbie: Dreamhouse Adventures and the Barbie Brand of STEM

The total number of Barbies sold between 1959 and 1995 would circle the world more than three and a half times if placed head to toe (Rand, 1995). In 2008, Mattel estimated that three Barbies were sold every second, meaning the total Barbies sold in that single year could wrap around the world over six times (Goldhill, 2014). In 2014, that estimate had dropped to one Barbie sold every three seconds (Goldhill, 2014). As of 2019, Barbie is coming back to prominence with a five year high in sales (Whitten, 2019). This uptick is part of Mattel's multiyear marketing efforts to shake controversies about the negative cultural values and beauty standards Barbie is seen to promote. Part of this media and advertising push has been reintroducing and emphasizing Barbie in the roles of various STEM related careers.

In 2018, Mattel announced the Dream Gap Project. The goal of the project is to close the Dream Gap, which Mattel defines as a lack of self-confidence girls start to demonstrate around age 5 (Diaz, 2018). One goal of the project is to highlight at least 10 prominent women from across the globe each year by immortalizing them with their own doll figurine (Mattel, 2019b). In 2019, Mattel announced they were partnering with National Geographic to produce a line of dolls centered on STEM careers also in support of the Dream Gap Project (Mattel, 2019a). This continues a long trend of Barbie in various STEM jobs with all her various pink science accessories, which is a foundational element of the Barbie ethos (Coleman, 2001; Driscoll, 2008). While Mattel states they are committed to getting every last detail right and has started to produce more realistic STEM tools (Fiesler, 2016), research psychologists Aurora Sherman and Eileen Zurbriggen (2014) found that whether girls played with a Barbie doll dressed in a lab coat or a fashionable outfit, in both cases the girls had a more limited view on their future career

options after playing with a Barbie doll. Additionally, as many critics have also pointed out, Mattel often undermines its attempts to promote Barbie in STEM (Associated Press, 1992; Bates, 2017; Elsesser, 2019; Ribon, 2014; Zarrell, 2014). This begs the question, is there any actual way for Mattel to encourage girls to pursue STEM careers with Barbie?

In this chapter, I argue Mattel cannot successfully promote STEM with Barbie, as no matter their efforts Barbie still promotes traditional gender roles and neoliberal views of technology, further damaging the leaky pipeline they profess to patch. To develop this argument, I will first explore Barbie's brand image, which is often characterized as constantly evolving. Then, I will look at Barbie's STEM careers, which are a decidedly mixed bag, but have aimed to broaden the appeal of Mattel's star over the years and make STEM fields more attractive to young girls. Finally, I use the animated series *Barbie: Dreamhouse Adventures* as a case study for how Mattel continues to promote traditional gender roles via STEM and neoliberal views of technology in their mediated content.

Barbie's Brand Image

According to Mattel, the secret to Barbie's continuing success is her ability to reinvent herself for every generation (Driscoll, 2008; Haig, 2004; Stone, 2010). In fact, girls studies scholar Catherine Driscoll (2008) sees Barbie as a product "of *all* the times and places in which she is and has been produced" (p. 39, original emphasis). Mattel sees Barbie as a doll of infinite possibility that can inspire generations of girls to follow their dreams. Barbie inventor and Mattel co-founder, Ruth Handler views this evolving aspect of Barbie as representing "the fact that a woman has *choices*" (Stone, 2010, p. 7, original emphasis). Mattel further emphasizes that, from her origin, Barbie has always been able to "inspire little girls to think about what they wanted to be when they grew up" (Haig, 2004). Meg Cabot, a *New York Times* bestselling author, reflects

this sentiment in her “Barbie Fix” forward in Stone’s 2010 book *The Good, the Bad, and the Barbie: A Doll’s History and Her Impact on Us*. Cabot writes “[Barbie] always existed solely for little girls to project their own fantasies onto” and “she taught us...we could be anything we wanted to be” (pp. 2-3). In many ways, this assessment is not unwarranted. As of 2016, Barbie has been portrayed as having over 200 careers, many of them nuanced repetitions of previous jobs (Mattel, 2016). Barbie was even running for president at the same time as Bill Clinton in 1992, sixteen years before Hillary Clinton ran for President (Halzack, 2016). Of course, unlike Hillary Clinton, Barbie wins her election. In 2000, Barbie’s presidential platform was “opportunities for girls, educational excellence and animal rights” (Haig, 2004, p. 59). Barbie has been both a commercial pilot and an Air Force pilot (Driscoll, 2008). In 2019, as a part of its 60th anniversary celebration of Barbie, Mattel released a Barbie firefighter doll (TTPM, 2019). Meg Cabot praises Barbie for inspiring her friends’ careers as voice over actor, literature professor, Humane Society director, and her own career as a writer (Stone, 2010). While Mattel capitalizes on the adaptability and inspirational potential of Barbie, I would argue Barbie, spot-lit as a cultural icon, is also inherently characterized by controversy.

Barbie has been a controversial figure since her release in 1959. In early product tests and production, many mothers criticized Barbie for her adult appearance (Coleman, 2001). Nevertheless, Barbie sold three editions, approximately 300,000 dolls, in its first year, which was considered a smashing success (Forbes, 2009; Peers, 2008). This success was due in part to Mattel strategically placing Barbie’s first televised advertisement during Disney’s *Mickey Mouse Club* (Driscoll, 2008). However, parents who grew up during the Great Depression remained wary of Barbie because her “world seemed narcissistic and extravagant” and the doll herself too

alluring (Coleman, 2001). In response to the criticism, Barbie received her first redesign in 1960, which made her face seem more innocent with big eyes and less pouty lips (Coleman, 2001).

The year 2000 marked a redesign for the Barbie brand. That year Mattel found that girls in countries outside of the United States were just as willing to buy the original blonde Barbie as American girls regardless of their ethnic characteristics (Haig, 2004). This led to Mattel taking a more one size fits all approach. Rather than produce more ethnically nuanced Barbies as they had in the past, Mattel started to use the same mold and the same marketing strategies across the globe (Haig, 2004). For example, the 2002 Rapunzel Barbie had a single global marketing strategy making \$200 million in its first year of sale (Haig, 2004). Rapunzel Barbie also marked a turn to Barbie playing more fantastical and fantasy filled roles in the 2000s. According to Solman (2004), Barbie advertising was shifting to focus on the animated worlds Barbie has inhabited in her direct-to-DVD films. According to Tim Kiplin, then Mattel Senior Vice President of Marketing and Design, this change was done to “reinforce the idea of producing story content around this Barbie world” (Solman, 2004, para. 2). This new strategy could be seen in the direct-to-DVD film made to accompany Rapunzel Barbie, *Barbie as Rapunzel* (Haig, 2004). Needless to say, Mattel’s new marketing strategy did not keep Barbie relevant for as long as they might have hoped.

In 2012, Mattel began to see a steady decline of Barbie’s share in the world toy market (Goldhill, 2014). By 2013, Barbie had lost 10% of her 2011 world market share (Goldhill, 2014). In 2014, Mattel faced three straight quarters of drops in Barbie sales (Goldhill, 2014). Mattel responded by returning Barbie to her “roots,” by stirring up controversy with Barbie taking the cover of *Sports Illustrated*’s 2014 swimsuit issue with the word, “#Unapologetic,” accompanying her image (Elliot, 2014). The shoot returned Barbie to her beginnings as a fashion

doll wearing a black and white striped bathing suit. A spokeswoman for Mattel argued that Barbie in the swimsuit issue gave “Barbie and her fellow legends an opportunity to own who they are” as Barbie herself has often come “under criticism about her body and how she looks” (Pathak, 2014, para. 5). The stunt was met with mixed reviews. According to *The New York Times*, detractors complained that it was “easy to be unapologetic about your body” especially when it represents the ideal beauty standard (Elliot, 2014, para. 6). Some people found the whole stunt creepy, while others wondered if the photo shoot was appropriate for a children’s toy (Elliot, 2014). However, Mattel saw the spot as an opportunity to redefine Barbie for the contemporary consumer (Elliot, 2014).

In 2015, Mattel released their new ad spot from advertising agency BBDO, “Imagine the Possibilities.” The ad features young girls in real life situations portraying the jobs that they one day wish to have including: college professor, men’s soccer coach, veterinarian, businesswoman at the airport, and natural history museum guide (Barbie, 2015; Madov, 2015). According to Matt Miller, BBDO’s executive creative director, the ad was inspired by “a quote by Ruth Handler, Barbie’s creator, saying that she created Barbie to show girls that they had choices” (Madov, 2015, para. 6). Kristina Duncan, Barbie brand’s vice president of marketing communications, indicated the ads were meant to target millennial parents who “are more likely to respond to brands that stand for something” (Madov, 2015, para. 7). Earlier in the same year, Mattel introduced three new body types for Barbie: curvy, tall, and petit (Dockterman, 2015). The new body shapes were featured by a new 2014 line of Fashionista Barbie dolls, which is “a collection of 23 dolls that feature eight skin tones, 14 different facial sculpts, 18 eye colors, 22 hairstyles, and 23 hair colors and fashions” (Rodriguez, 2015, para. 1). As a result, Barbie is at a five year high of sales, with a 12% uptick (Whitten, 2019).

Mattel and the Barbie brand has continued this trend of promoting Barbie as an agent of progressive values. For example, in October of 2018, they announced “The Dream Gap Project.” This advertisement features young girls quoting statistics on how starting at the age of five “girls stop believing they can be presidents, scientists, astronauts, big thinkers, engineers, [and] CEOs” (Diaz, 2018, para. 4). In further press, the Barbie brand announced it was going to fund, in partnership with New York University Associate Professor Andrei Cimpian, “a two-year post-doctoral fellowship to further study the Dream Gap, which is still an under-researched subject especially in the case of girls from 5 to 7” (Diaz, 2018, para. 5). While Barbie sales are improving in recent years, Barbie remains a controversial figure. Clearly, the new ad campaign’s rhetoric is postfeminist and neoliberal in nature, as it mostly assumes a stance that if girls have enough motivation, they will successfully struggle through the odds to reach their goals (Fraser, 2013; McRobbie, 2004). This is opposed to a more holistic feminist view of taking collective action to remove the barriers and rectify the institutional societal inequality that bar women from participating in STEM and other jobs. These issues become clearer as the Barbie brand more intentionally pushes into the realm of STEM.

Barbie and STEM

In 1965, Barbie was first introduced as an astronaut, which Mattel is quick to point out is four years before Neil Armstrong walked on the moon and thirteen years before Sally Ride became the first American woman in space (Mattel, 2016; Zimmerman, 2018). Since then, Barbie has been an Astronaut in 1986, 1994, 2013, and 2019 (Brabaw, 2019; Pearlman, 2013; Peers, 2008). In 2013, Mattel partnered with NASA to commemorate the one year anniversary of the Curiosity rover landing on Mars with the release of Mars Explorer Barbie (Pearlman, 2013). The year 2019 marks the 60 year anniversary of Barbie, leading Mattel to produce a 60th

Anniversary Astronaut Barbie (Brabaw, 2019). This follows a pattern of Barbie's careers pushing gender boundaries. Barbie has been sold as numerous types of doctors, including a surgeon and an Army medic, since 1973 (Driscoll, 2008). In 2016, Barbie was released as a Robotics Engineer, with a laptop that actually featured a coding program and notably was not available in her trademark pink (Fiesler, 2016). In fact, Mattel claims Barbie "has had over 200 inspirational careers" (Mattel, 2016). However, despite Barbie's various forays into STEM, questions remain about the actual effects of her maker's marketing-driven presentations of Barbie in different careers.

Undermining Barbie's STEM careers to date, Teen Talk Barbie was introduced in 1992 with a key phrase, "Math is tough!" Women's groups such as the American Association of University Women took serious issue with the phrase (Associated Press, 1992). They argued the Teen Talk Barbie reinforced "how schools shortchange girls" (Associated Press, 1992, para. 3). In 2014, Mattel misstepped again with the book, *Barbie: I Can Be A Computer Engineer*, which featured Barbie's inherent ineptitude with computers. Barbie designs but does not code for the game that she is creating, and she also inadvertently spreads a computer virus to her and her sister's laptops; eventually the viruses are fixed by her male friends (Ribon, 2014; Zarrell, 2014). In 2017, Mattel released Engineering Barbie, taking on another field in which women are grossly underrepresented. Cultural progress is frustrated, though, because the only products this Barbie could build were in some way tied to fashion or housework. She could make a moving clothes rack, a washing machine, a jewelry holder, a shoe rack, or design dresses, all in pink (Bates, 2017).

On a more positive note, in 2019 Mattel released a series of new Barbies to target the dream gap. In February 2019 Barbie announced a new line of dolls which feature two dolls with

visible disabilities; one has a wheelchair, the other has a prosthetic leg (McNamara, 2019). Also, in 2019 Mattel announced a line of STEM related and adventure Barbies coming out in partnership with National Geographic in support of Barbie's newly developed Dream Gap campaign. The new dolls announced include Barbie as a wildlife conservationist, astrophysicist, polar marine biologist, wildlife photojournalist, and entomologist (Mattel, 2019a). However, the new line is already getting flack. Forbes writer Kim Elsesser (2019) argues that STEM Barbies are not the way to get girls into STEM. Elsesser (2019) cited a 2014 study by Aurora Sherman and Eileen Zurbriggen which found that no matter how Barbie was dressed, as a doctor or as a fashionista, girls who played with the toy viewed themselves as having fewer career options. This finding supports the results of Diana Betz and Denise Sekaquaptewa (2012) study which found that hyper-feminine examples of women pursuing degrees in math and science demotivated young girls.

Mattel's troubling forays into STEM with Barbie are not limited to the physical toy and her accessories. Barbie movies and digital screen productions also portray problematic STEM messaging. In 2016, tech inspired films *Barbie: Spy Squad* and *Barbie: Star Light Adventure* came out direct-to-DVD. In *Spy Squad*, Barbie and friends are gymnasts turned spies to catch an infamous cat burglar who is about to steal the final gem needed to activate a world ending device. While the spies have cool gadgets, and Barbie's friend Teresa voices technical know-how, viewers only see the white male Lazlo actually inventing and distributing his snazzy tech inventions to the spy squad. In *Star Light Adventure*, Barbie is shown with some tech skills as she fixes her hoverboard, but her ultimate useful skills for the movie come from her purely physical ability to ride the hoverboard and a magical singing voice. Clearly, these 2016 films' attempts to relate to STEM were less than stellar. The 2017 film, *Barbie: Video Game Hero*,

does a better job by showing Barbie use computer programmer skills to save a video game world. However, the movie still relies on the magical premise that Barbie has been sucked into the world of her own video game. This brings us to Mattel's latest digital adventures with Barbie, *Barbie: Dreamhouse Adventures* and the tie-in Barbie vlog on YouTube. In the next section, I explore how *Barbie: Dreamhouse Adventures* and its tie-in media content fit within the Barbie brand and today's broader cultural context of promoting diversity and women in STEM. Most importantly, I will describe how the messages in *Barbie: Dreamhouse Adventures* fall short of fixing the leaky pipeline for girls and women in STEM.

Problematic STEM Messaging of *Barbie: Dreamhouse Adventures*

Barbie: Dreamhouse Adventures was announced in 2016 and stems directly from Mattel's effort to make Barbie more inclusive and personable (Wolfe, 2016). The show aims to answer fan requests to know more about Barbie and her family by following the adventures of Barbie, her sisters, and her friends. A key intention is to "have every girl believing anything is possible" (Wolfe, 2016, para. 4). Along with this emphasis, the series also incorporates references and plotlines involving STEM as much as possible. In many ways the web series seems to be a longer form of Barbie's vlogs which started in 2015 and have since adapted their style to more closely reflect the show. The vlog, much like the show, is a mixed bag of Barbie sharing beauty tips, addressing systemic inequality, cooking with friends, and promoting prominent historical women in the arts and sciences (Vincent, 2018). Similarly, *Dreamhouse Adventures* is done in a reality TV vlog style, with cuts to Barbie providing commentary on events throughout the episodes in front of her computer. The topics range from STEM to magical fairies. Nevertheless, each twenty-three minute episode is packed with some sort of family friendly lesson. The series currently consists of twenty-six episodes over three seasons totaling

roughly nine hours of content. Each episode features Barbie either interacting with her family (mother, Margaret Roberts; father, George Roberts; and younger sisters, Skipper, Stacie, and Chelsea) and/or on adventures with her friends (Teresa, Renee, Daisy, Nikki, and Ken). While the mixed bag of topics does present a well-rounded Barbie, I argue that most instances of STEM are undermined by factors such as traditional gender roles and consumerist neoliberalism.

Traditional Gender Roles

While *Dreamhouse Adventures* does try to push gendered interests in STEM with moments of learning that Chelsea's bear is named Dr. Wiggles, Stacie thinks bugs are cool, and Margaret works as a mechanical/computer engineer, these "progressive" gender roles are often undermined by a variety of themes that fail to address the causes that create the so-called leaky pipeline. Much like other examples of this genre, being a woman is portrayed as somehow incompatible with scientific careers. More specifically, *Dreamhouse Adventures* exhibits three recurring plot devices that reflect traditional gender roles, including explicitly feminized science, displays of incompetence, and pretend play science.

Feminine STEM. Whilst portraying STEM interest or activities, the Roberts family and friends are often shown reinforcing hegemonic feminine characteristics and expectations. In particular, STEM is often linked to caretaking, heteronormativity, and girl culture. Together these three traditional gender roles work to feminize stem which can be ultimately restrictive to girls interest in STEM careers (Betz & Sekaquaptewa, 2012).

Throughout the series interest in STEM and working with technology is linked to the traditional female gender role of caretaking, especially in regard to emotions and food. Chelsea is most often seen throughout the series wearing a shirt with the atomic symbol, which is a loose representation of the way atoms are constructed. However, Chelsea's atomic symbol is made up

of purple hearts, which is an obviously girly way to express interest in science. It also connects back to traditional gender roles because the heart symbol is associated with emotions and feeling, and women are stereotyped as being overly emotional, which is antithetical to the logic that is imbued in the STEM fields (Colatrella, 2010). Furthermore, in episode 8 of season 2 we see Skipper and Stacie using the Roberts' 3D food printer to make a phone shaped cake. Once again, science and technology are being used for the traditional female role of cooking. In episode 2 of season 1, Barbie, Skipper, Stacie, Nikki, and Teresa decide to upgrade Chelsea's outdoor clubhouse, which looks like a typical playhouse for a little girl. While the upgrade does involve designing a new look, which Nikki and Stacie put together, the toy being upgraded is still a playhouse that comes with a kitchen play area and pink trim, ultimately reinforcing stereotypical images of "girl play" as a way to prepare for the adult woman task of keeping a home. Additionally, we see very little of the work process to clean up and transform the Dreamhouse, which further divorces the characters from the manual labor of STEM, perhaps because it's not girly to depict sawing or painting. Episode 7 of season 1 starts off with Barbie noting how baking is a science. While this is technically true, baking is still considered a traditional feminine occupation. Later in the episode, Barbie and her sisters engineer robotic arms that will respond to Barbie's actual movements so that she and her sisters can remake an anniversary cake to replace the one that she had originally made because Skipper accidentally destroyed the first one. While this also has the positives for female STEM collaboration and showing some of the actual process of technical creation, the invention is nonetheless being used to bake a cake. In season 2, episode 2, "Life Can Be a Dream," Barbie has a dream about the various careers that she could have in the context of the work necessary to save her city from a giant object falling from the sky. In the show, Barbie as Mayor, is in a plane with her friends and numerous other Barbies.

Daisy asks if anyone is there to hand out pretzels. Renee responds, “You mean like Flight Attendant Barbie?” (Keenan & Pistor, 2018). To which a new career Barbie replies, “She’s not here, but you got me, Pilot Barbie” (Keenan & Pistor, 2018). Pilot Barbie then proceeds to hand Daisy a bag of pretzels, and the audience is never shown Pilot Barbie actually flying the plane. This undermines the purpose of a Pilot Barbie, as all we do is see her performing the tasks of a flight attendant. Flight attendants are stereotyped as primarily female because the act of caring for others is seen as primarily a feminine role. However, later in the episode we do see Mayor Barbie piloting a helicopter, which may somewhat make up for the commercial Pilot Barbie snafu. Nevertheless, these examples add up to a restricting view of STEM as primarily being related to women’s caretaking abilities.

Secondly, *Dreamhouse Adventures*, pushes traditional values of hegemonic heteronormativity in relation to STEM. In season 1, episode 1, “Welcome to the Dreamhouse,” the mother’s engineering skills are called into question as the Dreamhouse malfunctions. Margaret is annoyed when her husband, George, suggests that maybe she made a mistake in the house’s coding. To make up, George says somewhat nervously, “You’re so pretty.” This shows stereotypical heteronormative argument tactics. These tactics are clearly misguided and to the show’s credit Margaret is not impressed. At one point in season 2 episode 5, Barbie and Ken get stuck in a secret annex room that is part of a larger escape room related to time travel and a love story between a mad scientist and the woman whom he loved. The annex room is designed to look like a cave from prehistoric times. Barbie speculates whether she and Ken have actually time traveled through a wormhole. Ken baldly replies, “That’s not science” (Keenan & Pister, 2018). The scene may be interpreted as a stereotypical moment of a boy feeling the need to explain to a girl something she already knows, in many cases better than the boy, which has been

commonly termed as mansplaining. The solution to escaping the annex is to put together two halves of a heart box in order for the mechanisms to open the box to work, which is mechanical in nature but also is centered on the idea of heteronormative love. In fact, the escape room episode hints that Barbie and Ken are developing romantic feelings for each other. Additionally, it is a male mad scientist and the woman lacks even a job title and is simply referred to as “his love” (Keenan & Pister, 2018). Finally, the solution to the whole escape room, 11:11, seems less mathematically based and more romantic because it is based on the idea of two people standing together in time. Thus, not only is the science speculative but is framed as a love story, which because of their emotional content are traditionally seen as stories for girls. This narrative is additionally reinforced as Barbie has a cut scene where she gushes about the romantic nature of the story. This reinforcement of hegemonic heteronormativity in relation to STEM can be discouraging to girls who do not identify with heteronormativity.

Finally, *Dreamhouse Adventures* reinforces the dominant narratives of girl culture by portraying Barbie and her friends and family using STEM practices of exploration and discovery to create fashionable outfits, fun parties, dancing robots, and obtain fame. In season 1, episode 6, Barbie and friends stop at a dinosaur museum, which we only see the entrance of. However, the second stop they make is at a cave full of sparkly gems, which we do get to see. As everyone goes into the cave, Nikki comments that she can find sparkly stones to make jewelry and complete Daisy’s DJ outfit she is designing. It seems like a missed opportunity that we spend more time with sparkly rocks than dinosaurs. Girls are supposed to be interested in shiny pretty things. This use of sparkle links with Kearny’s (2015) third form of sparkle adornment, which includes “sparkly makeup, sequined clothing bejeweled accessories” (p. 269). Kearney (2015) argues that such eye catching adornment perpetuates the postfeminist view that “performance

and celebrity [are] chief modes of empowerment for *all* girls” (p. 269, original emphasis). Like other episodes, it does have some redeeming features, such as Teresa’s excitement over the geological conditions of the cave and the use of the gems to cleverly refract light to make it easier to see in the cave. In Episode 7 of season 1, Barbie gets the opportunity to go to a robotics convention to turn her robot design into a reality. At the convention, we are shown the robot Barbie is working on is meant to be a dance robot. Thus, the robot reinforces the idea that girl culture is about having fun rather than world saving inventions. The final episode of season 2, “A Delicate Situation,” features Skipper and Stacie going through the engineering process of their new product, socks with skates on the bottom, which reinforces the idea that science for girls focuses on creating fun rather than world saving projects that could equally interest girls. In season 3, episode 1, “Virtually Famous,” Teresa uses statistics and tracking algorithms to plan out videos that will go viral and make Barbie’s vlog popular. Ironically, Barbie’s actual YouTube channel has over 5.7 million subscribers. Throughout the episode we see Teresa creating various graphs and charts based on data collected in real time. As Teresa says, numbers are “only the epicenter for understanding the entire universe!” (Keenan & Pistor, 2019). While the episode prominently features a real life application of mathematics, the purpose of the math is to promote being seen and famous, which is a dream commonly sold to young girls. Clearly, *Dreamhouse Adventures* continues to define and reinforce the elements of girl culture via STEM activity. This practice inherently undermines STEM use for the benefit of humanity and focuses it on the arguably trivial values pushed by girl culture.

Incompetent in STEM. Throughout *Dreamhouse Adventures*, when women and girls practice STEM, they are often shown as struggling and incompetent. These portrayals ultimately work to reinforce stereotypes about women in STEM being less capable and more dangerous

than their male counterparts (Colatrella, 2011). This plays into a larger narrative of women being seen as less valuable outside the home. For example, in season 1, episode 1, the Roberts family finds that a squirrel has chewed the wiring of the dreamhouse, causing it to malfunction. Margaret ends up shocking herself trying to fix the system. While she ultimately prevails, the moment she gets shocked re-enforces ideas that women are less competent in STEM. In the episode about upgrading the playhouse, there is a scene where Teresa describes the app she designed to triangulate the location of a person based on their phone signal. Admittedly, in the same scene, there is a woman, named Ben, who owns a junkyard who is completely baffled by Teresa's science talk. Thus, Teresa's tech savvy is portrayed as elitist. In season 1, episode 6, "Road Trip," Barbie, Daisy, Teresa, Nikki, and Renee are all driving in the Dream Camper to a festival where Daisy is going to be the DJ. Along the way, Daisy makes various stops because she is nervous about getting to the show. For one stop, she pretends to be really into dinosaurs, so they stop at a dinosaur park. At the park, Teresa, Nikki, and Renee stay and relax in the camper, while Barbie and Daisy go to the museum. Rather than see Barbie and Daisy actually explore the dinosaurs, we only see them leaving and entering the park. Additionally, Daisy buys a stuffed dinosaur as a souvenir without knowing its specific type. Her ignorance in the scene demonstrates her actual lack of knowledge and interest in dinosaurs.

In season 1, episode 7, Barbie is invited to the All-State Robotics Convention where her work ultimately seems isolated and incompetent. Initially, Barbie is very excited, but going means she will miss her parents' 20th anniversary celebration. Her mother insists she should go, and Barbie turns her science homework into a real working robot. Even though it is exciting to see Barbie go to a robotics convention, especially in light of the fact that Barbie loves the world saving prospects of technology, what we see of the convention is Barbie alone at her table with

her robotics gear and charts. In short, it seems more like Barbie is sitting in the middle of nowhere alone rather than at an actual convention where she might have been interacting with a diverse community of robotics enthusiasts. Additionally, the robot Barbie is working on is meant to be a dance robot, which continuously malfunctions, despite Barbie “trying everything right” (Keenan & Pister, 2018). While the malfunctioning robot does show the process of real life engineering, Barbie is never shown making the final tweaks that actually make her robot work by the end of the episode. Thus, we never see Barbie actually demonstrate her ability to competently build and program a robot, which further reinforces her earlier incompetence.

Season 3, episode 3, “The Ballad of Windy Willows,” features a primarily negative view of technology, thus furthering negative stereotypes of women in STEM. Barbie and Daisy go to visit Barbie’s Aunt Adele in Windy Willows, Wisconsin. When they first pull in, we see Aunt Adele fixing the roof. However, rather than successfully completing her task, she ends up falling off the ladder. In the next scene, Barbie attempts to use an electric orange juicer to make orange juice and instead makes a mess in the common area of her aunt’s bed and breakfast. Later, in an attempt to help her aunt manage the hotel, Barbie upgrades her old vacuum cleaner to be self-propelled like a Roomba. However, her invention becomes out of control when the cat messes with it. The vacuum starts travelling around the B&B, even going up the walls and ceiling, culminating with the vacuum eventually exploding. Next, Barbie programs a remote control to adjust the furnace. Once again, the cat interferes with it, causing the B&B to become overly hot and it melts a large cheese statue of a cow resulting in another huge mess. Finally, in an attempt to bring guests to Adele’s B&B, Barbie and Daisy decide to hold a dance party where Daisy DJs. Unfortunately, all of Daisy’s DJ equipment causes the breaker to overload and the power to go

out. Thus, the episode in its entirety promotes the idea that women in STEM are dangerous and bound for disaster, which implies women should stick to their more traditional roles at home.

Taken together these examples of incompetence reinforce the specific gender stereotype of women being incompetent and even bordering on dangerous when involved in activities such as STEM outside of the home. This incompetence is further agonized as the show presumes a lack of interest in STEM by depicting pretend play science.

Pretend Play Science. Finally, *Dreamhouse Adventures* perpetuates pretend play in two main ways. First, characters and actions are continuously defying the laws of physics. Second, the show perpetuates false scientific information and implausible STEM situations. Together these features combine to portray women and girls as incapable of real STEM, further marginalizing them in a field dominated by men (Colatrella, 2011).

Barbie and her sisters are shown a number of times in situations that are unrealistic and are contrary to the laws of physics. At the end of episode 7 in season 1, Barbie is back at her computer desk with her now perfectly dancing robot that can also fly, but the lack of any visible flying mechanism such as wings or a copter makes it seem aerodynamically impossible. Finally, the most STEM heavy episode of the season is followed by the most magical episode in which Barbie's old doll temporarily comes to life as the magical Roof Fairy. This magical moment contributes to an ethos of unrealistic science that decidedly permeates season 2. In season 2, episode 1, Barbie gives up her tradition with her father and gives it to her youngest sister, Chelsea. However, Barbie ends up getting the traditional equinox pizza event after she decides to deliver the pizza to her sister and father. This involves Barbie and the pizza box in many gravity defying stunts as Barbie bounces from, flies through the air, and lands on the pizza box without a scratch. While the scene is clearly meant to be funny, it further depicts an ethos of girls not being

able to handle the serious nature of science. Season 2, episode 6, “Putts for Pups” features an unrealistic use of drone technology featured throughout the seasons. This episode features Chelsea’s ridiculous charity to teach dogs to read and her golf putting challenge fundraiser to benefit her charity. In this episode, Chelsea is shown dangling from a drone with a rope and harness in order to make a difficult golf shot. While some drones may be strong enough to hold a person, the design of the Roberts family drone leaves many questions about the feasibility of such a feat, especially given that most passenger drones look like mini helicopters (Holley, 2018). This held true in season 2, episode 1, where Stacie is hooked up to the drone in a similar manner, which is even more unrealistic as Stacie is older and heavier than Chelsea. Earlier in the episode, we see Barbie at a father-daughter charity golf tournament with George. George’s sneeze startles Barbie, which in turn causes her to make a physics defying shot that bounces off a tree and over a cliff ledge to land directly on Ken’s sandwich. Once again, the show reinforces the idea that only physics defying science is interesting. At the beginning of season 3, episode 1, Barbie’s phone bounces wildly around the pool area off the slide, floaties, and people in the pool to ultimately land in the water. Thank goodness for Barbie’s waterproof case! However, the actual scene of the falling cell phone is unrealistically lengthy since gravity would cause a falling phone to far less dramatically bounce around a tiny bit before a final landing. We also see Chelsea once again dangling from the drone. Clearly, these numerous physics defying falls and flying tie into a larger issue of unrealistic science depictions.

Second, the show either promotes patently false or implausible science which promotes the idea girls are either not smart enough to know the difference or they are just uninterested in science. In season 2, episode 1, “Balancing Act,” is about Barbie and George’s father-daughter yearly tradition of going to see a meteor shower on the equinox. The episode is filled with

physics defying fun facts and moments. For example, the episode purports the myth that eggs can only be perfectly balanced on the equinox (Portelli, n.d.). Additionally, there are no meteor showers that are close to the time of the equinox, and even if there were one, it does not mean they precisely fall on the day of the equinox every year as the show depicts Barbie and her father's yearly tradition. For example, in 2018, when the series came out, none of the normal expected meteor showers were near the equinox (St. Fleur, 2018). These misrepresentations of facts undermine genuine science and undermines girls' ability to learn real science, with the implications that the underlying rhetoric is that girls are not smart enough for science. Episode 3 of season 2, "Trey is for Horses," continues the season's foray into unrealistic science. This time animal behavioral science is called into question. The episode starts with Chelsea trying to raise money to teach dogs to read on behalf of her Malibu Puppy Literacy Association charity. This scene is followed by Skipper teaching dog tricks to a horse, which may be possible, but it is an abnormal position for a horse to sit like a dog and is considered a potential sign of colic (EquineSpot, 2019). Afterwards Barbie teaches the horse to dance, which starts out realistic enough, but ends up with the horse breakdancing. Again, the movements defy science, giving way to pretend science that in reality would probably lead to otherwise avoidable injuries to the animal (EquineSpot, 2019). As a whole, these examples once again play into the idea that real science would not be interesting to girls. "Time Will Tell," season 2, episode 5, sees Barbie and her friends visiting an escape room with a time travel love story theme. As such, the room is littered with scientific-looking images and devices. For example, there is a pair of binoculars which makes the user see everything in the room as double. There is also a recreation of Leonardo da Vinci's Vitruvian man as well as many schematic drawings of machines. However, the science is undermined as at one point, Barbie and Ken end up in a separate room that looks

like a cave from prehistoric times. Barbie speculates whether she and Ken have actually time traveled through a wormhole. Ken replies “That’s not science” (Keenan & Pister, 2018). Barbie replies “Sure, yet to be proven science” (Keenan & Pister, 2018). Thus, we are back in the realm of play science, not quite science.

Consumer Feminism/Neoliberal Values

Beyond the gendered elements of *Dreamhouse Adventures*, the show also promotes consumer neoliberal cultural messaging at every turn. In this section, I describe how STEM practices and technology in the show are used to promote three essential themes that normalize and erase problematic features of STEM: the capitalistic values of surveillance, consumerism, and entrepreneurship. This may lead to girls forming less critical opinions about the field of STEM, which could possibly lead them into supporting the very structures that make it difficult for women to succeed in STEM.

Capitalistic Values of Surveillance. While surveillance methods are only used once in the typical way businesses use internet and focus group data to develop and refine their next products, the show is characterized by covert and overt data gathering via technology such as telescopes, binoculars, and phones. I argue that this type of surveillance is similar to and normalizes the data mining done by digital tech companies in service of their business and other corporations. The first real example of market research is in season 3, episode 1 “Virtually Famous.” Teresa uses math and tracking algorithms to predict what kinds of videos will go viral and make Barbie and her friends internet stars. We see her using statistics to create graphs mapping the hot trends of the moment and correlating those trends to Barbie’s views as may be inferred from her four computer screens running various stat software and displaying a multitude of charts. This example most directly promotes an uncritical attitude towards capitalism and

market research. Teresa's work is viewed inherently as a positive means to becoming popular. While Barbie is not totally happy following the trends just for views, there is no instance in which Teresa's plan and math skills are not working. The other examples are primarily covert or overt surveillance and documentation, which does not directly promote the benefits of market research but does normalize the idea of technology being used for tracking and branding purposes. In short, the show normalizes being watched, tracked, and used as data, morphing young viewers into the perfect neoliberal subject.

Throughout the series, there are multiple instances of covert surveillance. For example, in season 1, "Clubhouse (Remix)," Teresa has been developing a software that can track any cell phone as long as she has the number. In the following episode, "Nobody's Cupcake," Barbie's competition on an extreme baking show is using drone technology to video and spy on her as she prepares for the competition. Then, throughout the episode, Tammy Bounceaway uses wireless tech to receive tips from the producer of the competition to help her cheat to win the various contests. In the season 2 escape room episode, the escape room has surveillance set up to watch the progress of Barbie and her friends. The Roberts' unfriendly next door neighbors, the Reardons, spy on Barbie and her sisters as they develop promotional material to support Nikki in her run for city council. In season 3, in episode 8 and the second part of episode 7, "Barbie Roberts: Undercover Mermaid Part 2," Barbie and her friends use Barbie's telescope and phone to try and catch a jewel thief that has been plaguing the resort where they are vacationing. In fact, every episode has some sense of surveillance as the dreamhouse is constantly recording the actions of those inside. As such, *Dreamhouse Adventures* normalizes such practices of surveillance, leading viewers to accept being watched, watching others, and ignoring the privacy

rights that protect individuals against the large companies that wish to benefit from tracking them and their every move.

The normalized treatment of tracking and being tracked is shown in the show's depiction of video recording and how it is used purposefully to document specific events for experimental and research purposes. For example, in season 1, episode 4, "The Great Pioneer Adventure," Ken is asked to film the Roberts family trying to live like pioneers for a weekend. In "Picture Perfect Cake," video technology is used so Barbie can help bake a cake for her parents' anniversary and participate in the events while she is at a robotics convention. In "Life Can be a Dream," season 2, episode 2, Barbie dreams that she is multiple people with different jobs; for example, in her dream she is simultaneously the Mayor of her city, while another version of her is a reporter. Thus, throughout the episode the reporter is consistently documenting the events that transpire. In episode 6 of season 2, Barbie and Nikki act as commentators for the recording of Chelsea's charity event to raise money for her Puppy Literacy Association. In episode 7 of season 2, "Balancing Act," Barbie helps Chelsea place a mini camera on a puppy's collar to document animal behavior for Chelsea's school science project. In the following episode, "A Day at the Beach," the episode initially starts off with Renee, Daisy, and Barbie going to the beach to record the sound of tidepools for one of Daisy's DJ mixes. Season 3, episode 1, "Virtually Famous" is all about documenting hijinks for viral video views. In season 3, episode 6, "Totally Spying," Skipper records Stacie skateboarding with a drone mounted camera and Stacie has a helmet camera. Later in the same episode, the helmet camera is used to prove Trey Reardon is lying about tripping over Stacie's skateboard and hurting his leg. Additionally, the stories Barbie shares are meant to give the viewer a peek into her life. As such, it promotes this consumeristic notion of self-branding with vlogging your documented experiences. Only Chelsea's puppy cam

is used for a specific scientific purpose, while almost every single depiction of recording is about branding oneself, participating in consumer culture, and making one's private actions available to be watched by others.

Consumerism and STEM. Secondly, *Dreamhouse Adventures*, portrays STEM use to support an extravagant lifestyle. This principle is most evident in the dreamhouse itself. However, Barbie's car and camper van also have over-the-top fancy technology. For example, in the dreamhouse, the stairs turn into a slide that lands in a ball pit. In the kitchen, there are multiple kinds of juice on tap at all times. There is also a 3D food printer. Each girls' room is specially designed to fit each girl's needs. For example, Chelsea's room has a tea set that will pop up out of the floor. Stacie's side of the room that she shares with Skipper, has a bed that can be raised or lifted to clear her space so she can play basketball. Similarly, Skipper's side of the room has custom installed DJ tables. Barbie's room can be converted into a dance disco space for exercising. She has a closet that pulls up specific outfits one at a time. Additionally, there is a system that Barbie has in her room for catching her sisters in a net if they try to sneak in and play a prank. In fact, by season 3, Barbie has her room set up so that when she sits on the bed, her room immediately goes into sleep mode, and when she steps on her dance matt, her room will not let her stop until she has finished a full workout. This feature in particular promotes postfeminist/neoliberal thinking because it perfectly encapsulates Barbie's mentality of "I don't do quit" which is a way of promoting jumping through the hoops to make it to where you want to go, rather than collectively working together to level the playing field (Rottenberg, 2014). Similarly, in season 1 episode 2, we learn that Barbie's car can automatically expand from a two seater to a five seater. Also, when the campervan expands, it opens up and out to create a mini pool with a slide. Broadly, all of these handy and fancy uses of technology contribute to

promoting the use of STEM to benefit the rich. This can be seen in the fact that the cul de sac upon which the Roberts live depicts expensive homes. Thus, the videos stoke a particular version of the American dream under neoliberal capitalism that favors the wealthy and perpetuates the belief that anyone can have a sweet dreamhouse life if they just work hard enough (Rottenberg, 2014).

Entrepreneurship and Capitalism. Finally, STEM practices in *Dreamhouse Adventures* are used to promote entrepreneurial practices, which help fuel a capitalistic market. The first explicit use of technology to promote business is at the end of season 1, episode 5, “Baby Sister Babysitter,” when Skipper creates an app to promote her babysitting business. In episode 3 of season 2, we are first introduced to Chelsea’s Malibu Puppy Literacy Association. She is making a video to post online to raise money for her “charity.” In episode 6 of season 2, Chelsea arranges to have a charity putting event around the cul de sac to raise money for her Puppy Literacy Association. In the video of the event Barbie and Nikki are making, Nikki refers to Chelsea as a “young golf entrepreneur,” thus directly tying Chelsea’s event to capitalistic efforts. In the same episode, Chelsea becomes upset because the next-door neighbor made fun of her for thinking dogs could read. Barbie consoles her by providing Chelsea a list of inventions and discovery that came about from STEM research on accident such as microwaves, x-rays, and penicillin. Thus, Barbie is comparing Chelsea’s theoretically unstable charity to research that at least had slightly more theory behind it leading to great inventions and discovery. I suppose it is possible Chelsea will discover something amazing trying to teach puppies to read, but it is highly unlikely. In episode 9 of season 2, “A Delicate Situation,” Skipper and Stacie are working on inventing socks with skates on the bottom. This turns out to be socks with roller wheels duct taped to the bottom. Nevertheless, throughout the episode, the audience is shown Skipper and

Stacie's multiple trial runs, which leads to the breakthrough of adding a break to one of the skates. On the positive side, these scenes demonstrate a scientific and engineering process. However, this process is closely tied to capitalistic endeavors as Stacie and Skipper argue over what to name their invention based on what name they think would be most marketable. Skipper thinks "Slide Socks" is the better name, while Stacie thinks "House Skates" is better. While both Chelsea's and Skipper and Stacie's projects can be tied to STEM, they also both inherently promote entrepreneurial capitalistic process over scientific discovery. Thus, while *Dreamhouse Adventures* occasionally shows Barbie and her friends practicing STEM in useful ways, it is always for profit. If it is feminism that the show is selling, it is a brand of neoliberal feminism that constantly reinforces capitalism, ultimately putting profit and individualism above all else (Rottenberg, 2014).

Conclusion

From 2014's incompetent Engineer Barbie to 2017's very pink Mechanical Engineer Barbie, Mattel constantly connects STEM to Barbie's traditional associations with numerous material possessions such as the perfect home, car, camper, and clothes (Coleman, 2001; Driscoll, 2008). *Barbie: Dreamhouse Adventures* continues this tradition, much in the same vein of Disney Fairies films, as both promote traditional gender roles and neoliberal ideals. In particular, Barbie promotes traditional gender roles by depicting STEM in relation to housework, heteronormativity, and typical girl culture. Additionally, Barbie reinforces the idea that girls are not meant for and are probably uninterested in STEM careers by showing Barbie, her friends, and her mother as constantly incompetent or defying the laws of science. *Dreamhouse Adventures* reinforces neoliberal ideals by normalizing surveillance, promoting consumerism, and emphasizing entrepreneurship. Ultimately, these depictions do not fix the leaky pipeline and

rather actively reinforce the structures that block women and girls from STEM. Thus, these views can be seen as normalizing the pipeline so it is viewed as girls' fault for losing interest in STEM, which is a neoliberal postfeminist perspective as it individualizes the issue to every girl rather than viewing it as a collective problem (Fraser, 2013; McRobbie, 2004).

However, Mattel is not the only toy company using a popular girls brand to push problematic messaging in relation to STEM. Hasbro has recently produced a new product line called My Little Pony: Equestria Girls, which takes a distinctly STEM bent to everyone's favorite ponies from *My Little Pony: Friendship is Magic*. In the next chapter, I argue the STEM content produced in the media surrounding My Little Pony: Equestria girls reinforces traditional gender roles and neoliberal ideals, providing yet another example of kids media that aims, but ultimately fails, to patch the leaky pipeline.

Chapter 3

My Little Pony: *Equestria Girls* and the My Little Pony Brand of STEM

A common myth surrounding the origin of My Little Pony (MLP) is that the product was developed entirely on Hasbro's market research (Connelly, 2017). In fact, the dolls started as the brain child of Bonnie Zacherle. Zacherle explained that her inspiration for the toy line was her own childhood in which as a little girl she wanted nothing more than a pony (Low, 2016). Hasbro initially produced her original line as My Pretty Pony, which were larger and painted more realistically than what is typically thought of as a MLP doll (Connelly, 2017). Yet, there is some truth to the marketing story because the ponies ended up with pastel colors based on Hasbro's product testing with young girls (Connelly, 2017). Thus, My Little Pony dolls became the bestselling toy for the next seven years (Ellery, 2003). This first batch has been popularly termed Generation 1 (G1), which lasted from 1983 to 1993 (Connelly, 2017; Lepitre, 2008). Soon after, Zacherle left Hasbro, and Hasbro continued to develop MLP by promoting the ponies with an animated television series of the same name as the brand, which ran for two years, 1984-1986 (Connelly, 2017).

In comparison to Barbie, My Little Pony has a relatively short history of consciously promoting STEM careers for girls (Seiter, 1993). Even though STEM was apparent in early My Little Pony television shows through the depiction of the industrialization of natural processes, it was not until *My Little Pony: Friendship is Magic* in 2010 that obvious attempts at showing girls or ponies in STEM was showcased. Then, in 2013, *My Little Pony: Equestria Girls* took things a step further by producing actual merchandise to go along with its STEM messaging. In *Equestria Girls*, the characters are not actually ponies but girls in high school located on a world separate from Equestria.

When *Equestria Girls* was first announced, adult fans of *Friendship is Magic* were apprehensive at best. The apprehension was due in part to the fact Lauren Faust, the creator of *Friendship is Magic*, was not a part of *Equestria Girls* development (Romano, 2013). On a larger scale there was a debate about who the show's target audience was. Some speculated the show was more for adult male fans of the show, Bronies, a contraction of "brothers for ponies" (Marcotte, 2013; Romano, 2013). Bronies thought the new show was too girly (Connelly, 2017). Mothers were worried the new humanized looks were detrimental to children's images of healthy beauty standards (Pesce, 2013). Hasbro thought *Equestria Girls* was a good way to expand the *Friendship is Magic* universe and celebrate the 30th Anniversary of the MLP brand (Schmidt, 2013a; Schmidt, 2013b). Very few critics responded to the portrayals of STEM in the show, however. Thus, a closer analysis of these themes in a brand trying to normalize STEM for girls is sorely needed, especially to determine how it might actually perpetuate the problem of the leaky pipeline.

In this chapter, I argue that *My Little Pony: Equestria Girls*, despite its more conscious attempt to promote girls in STEM, still stumbles into pitfalls that ultimately do not fix and, in fact, may contribute to the leaky pipeline. These pitfalls include reinforcing traditional gender roles by feminizing science, showing girls as dangerous in science, and showing more pretend science than actual science. Additionally, these pitfalls promote STEM in relation to neoliberal ideals such as individual self-promotion and materialism. In order to make this argument, I first provide a history of My Little Pony's brand image. Then, I discuss MLP's history with STEM representation, followed by a brief cultural context for *Equestria Girls*. Lastly, I provide an in-depth analysis of how *Equestria Girls* actually upholds traditional gender roles and neoliberal values in its representation of girls in STEM instead of a more progressive message.

My Little Pony's Brand Image

While Hasbro pedals MLP and its related media as innocent, girl friendly fun (Seiter, 1993), MLP media has been popularly characterized as trashy and cash grubbing, which reflects poorly on the dolls themselves (Connelly, 2017; Seiter, 1993). Generation 1 of MLP dolls is characterized by pastel colors, each pony with flowing manes, magical powers, and a human character trait like courage or vanity (Connelly, 2017). These Generation 1 MLP dolls were accompanied by the television series *My Little Pony* (1984-1986), the subsequent movie, *My Little Pony: The Movie* (1986), and a second television series, *My Little Pony 'n Friends* (1986-1987) (Connelly, 2017; Seiter, 1993). The original *My Little Pony* series draws directly from the dolls as the ponies live in Ponyland which draws its aesthetic from Disney's *Fantasia*, particularly Beethoven's Pastoral Sequence (Connelly, 2017). Episodes typically follow a group of pony friends who are helped by their blue eyed, blonde haired human friend, Megan, who lives over the Rainbow in the human world. Megan is repeatedly called on to save Ponyland from disaster by practicing emotional empathy and support (Seiter, 1993). The first film, *My Little Pony: The Movie* (1986) is essentially an extended version of this type of story arc (Connelly, 2017). *My Little Pony 'n Friends* continued to feature Megan and the ponies from *My Little Pony* (Connelly, 2017) in much the same vein as Generation 1's previous televised media, with episodes airing in 10 minute segments along with stories featuring other Hasbro merchandise.

Generation 2 of My Little Pony rolled out in 1997 and was so unsuccessful that production was halted two years later (Connelly, 2017; Lepitre, 2008). Yet, in a 1998 press release, Hasbro tried to boost sales by describing Generation 2 playsets as "reminiscent of the 1980s favorite that won millions of girls' hearts worldwide" (PR Newswire, 1998a, para. 8). The

four Generation 2 playsets included Secret Surprise Friends, Magic Motion Friends, Pony Magic Playsets, and the Pony Garden Play Case. Secret Surprise Friends came with “special accessories highlighting each pony’s individual personality” (PR Newswire, 1998a, para. 8). Magic Motion Friends heads can be turned, causing their legs and tails to also move (PR Newswire, 1998a). Pony Magic Playsets and the Pony Garden Play Case were made to be portable so they could “go wherever girls go with their collection of My Little Pony ponies” (PR Newswire, 1998a, para. 8). The only media to accompany Generation 2 was a CD-ROM game, for ages 3 to 7, where users could play with the ponies featured in Secret Surprise Friends and Magic Motion Friends who all lived in Friendship Gardens, Ponyland (Connelly, 2017; PR Newswire, 1998b). Five years later, as Generation 3 geared to launch in 2003, an article in PR Week explained that Generation 2 failed because the product had not been sufficiently updated (Ellery, 2003).

In 2001, Hasbro My Little Pony launched Generation 3 (“Our Work”, 2019). After much market research and product development, Hasbro approached Mason Williams PR firm to advertise this updated generation of MLP (“Our Work”, 2019). Mason Williams explained that one of their main goals for the campaign was to “make MLP an icon – stylish and fashionable” (“Our Work,” 2019, para. 12). Mason Williams considers their campaign a smashing success, suggesting their firm helped launch the retro toy craze and built MLP into the fashion icon it is today (“Our Work,” 2019). The marketing change is ironic when considering that Alpana Virani, Hasbro’s Senior Brand Manager, framed the 2003 return of MLP as a “return to innocence for young girls” because actually the “girls market is becoming more focused on fashion, glamour and glitz” (Connelly, 2017, p. 47). Ultimately, the changes reflect a goal stated by Hasbro’s vice president of North American Consumer Products that the relaunch was to “make [My Little Pony] a lifestyle brand” (Connelly, 2017, p. 48). One of the goals of the launch was to be more

character focused (Connelly, 2017). To achieve this goal, Hasbro worked closely with book publishers (Connelly, 2017; Raugust, 2003). As such, Generation 3 was licensed to HarperCollins for activity and board books, Running Press for novelty mini book kits, Walter Foster for how-to-draw books, and Publishers International for sound books (Raugust, 2003). Additionally, the retailers Target and Mervyn's were promotional partners who helped cross promote the physical toys with the mediated products (Raugust, 2003). Generation 3 had numerous television shows, several theatrical release features, and televised specials (Connelly, 2017). These animated features continued in the same vein as previous MLP media except this time the ponies were on their own as there were no humans working with them to save the day. However, three years after the Generation 3 launch, My Little Pony was being outsold by Littlest Pet Shop (Connelly, 2017). It was, once again, time for Hasbro to try something new.

While My Little Pony attempted to revamp Generation 3 with a focus on fewer pony characters, they were already developing Generation 4 with Lauren Faust, who had been hired in 2008 to develop a reboot series for My Little Pony (Connelly, 2017). Faust had originally come to Hasbro to pitch her toy line, Galaxy Girls, and had previously collaborated with her husband on *Powerpuff Girls* (1998-2005) and *Foster's Home for Imaginary Friends* (2004-2009). In 2009, Faust was announced as the new creative steward for MLP. The same year it was announced that a new television series was being created. Fans were concerned that with the reboot MLP would lose its popular essence and the critics were up in arms at Hasbro's continuous commercial promotion of its product lines (Connelly, 2017).

Finally, after a few years of production and market preparation, *My Little Pony: Friendship is Magic* debuted in 2010. Despite initial backlash, it was a smashing success and gained numerous youth and adult fans (Connelly, 2017). Faust (2010) admitted that her intention

behind creating *Friendship is Magic* was to buck the perception that shows based on toys for girls were boring and lame. She wanted *Friendship is Magic* to show girls that they do not have to be limited to one ideal depiction of a girl, but that there are many interests a girl can cultivate. Faust wanted to convey the messages that girls can be friends with girls who are nothing like them and that girls can be true to themselves. Faust also wanted her show to depict these values using the complex and engaging plots that girls crave (Faust, 2010; Frevele, 2011). Among the many things that Faust encouraged girls to do, aside from making friends, is to be creative, and to consider themselves more STEM minded.

My Little Pony and STEM

While the Generation 1 toy sets did feature domestic technology like lamps, microwaves, refrigerators, toasters, and sinks, the Generation 1 media primarily portrayed cutting edge technology as masculine in nature. Often natural processes, such as weathering stones and growing trees, were depicted as taking place in underground industrial factories (Seiter, 1993). For example, the Delldroves, “gnomelike male creatures,” were shown working in an underground factory to polish stones and hammer acorns before these items were placed outside on the ground as if they had naturally occurred (Seiter, 1993, p. 158). Other episodes involved male villains with treacherous machines that could destroy the Ponies’ world. For example, when Evil King Charlatan of the North Pole, a megalomaniacal penguin, wants to freeze the whole world with his new machine, it’s up to the Ponies and Megan to talk him out of it and remind him of his real priorities such as friends and family. Then the ponies are able to destroy the machine with a magic ray once the king realizes the error of his ways (Seiter, 1993). As such, in Generation 1 MLP media, technology is either used to minimize any impression of the harmful effects of industrial processes by linking them with natural processes or is made out to be

dangerous. Either way, these portrayals are not specifically about growing little girls' interest in STEM.

Generation 2 did not have any animated shorts or movies (Connelly, 2017). However, many of the toy lines featured transportation technology such as a carriage and a sailing boat. Additionally, one of the products sold was a toy flip cell phone on which you could talk to three of your favorite ponies. In contrast, Generation 3 had numerous shorts and movies. However, the technology use was relegated to the everyday and often traditional roles for women, such as baking. In fact, there is a whole series called *Meet the Ponies* with individual ponies throwing a party for their friends. In episode 6 "New Cake Party," the point of the party is to bake a cake. Other episodes, many about parties, involve skating, riding scooters, and karaoke. Often the ponies who cannot fly are shown using hot air balloons to get around and reach tall heights. Overall, technology is shown and commodified as toys to be used for fun, transportation, and domestic duties.

The development of *Friendship is Magic* marks the brand's first intentional foray into portraying girls in STEM. Some of the portrayal is similar to previous MLP media. For example, in the introductory animation for *Friendship is Magic*, viewers always see Twilight Sparkle in her hot air balloon which is also sold as a *Friendship is Magic* accessory (Connelly, 2017). Throughout the series, the ponies are shown utilizing a train pulled by a pink engine with hearts all over it and a cupcake looking supply car behind it. However, there are instances of more intentional depictions of ponies utilizing STEM skills. For example, in season 1, episode 15, "Feeling Pinkie Keen," Twilight hooks one of her friends up to a machine to get brain energy readouts in her lab in the basement of the library she lives in. The lab is decorated with large chemistry flasks containing green and blue bubbling liquid and odd-looking machines, a call

back to classic mad scientist laboratories. In season 1, episode 12, “Call of the Cutie,” one of the ponies encourages a friend in front of a crowd by saying she could grow up to “be a great scientist, or an amazing artist, or a famous writer. She could even be the mayor of Ponyville someday” (Faust, McCarthy, Thiessen, & Wootton, 2011). Clearly, it positively promotes science as a possible future job option, but it also plays into post-feminist ideals about endless opportunity. In season 2, episode 22, “Hurricane Fluttershy,” Twilight Sparkle helps the pegasus ponies record their progress on generating wind power using an anemometer, which is a real life device used to measure wind speed. However, much like in the Tinker Bell movies, the anemometer is being used because the pegasus are training to magically influence the weather in order to transfer water to the pegasus home city, Cloud City, where all the rain is generated for Equestria. Once again, science is being confused with magic and used to support industrial practices, in this case by unrealistically influencing weather phenomenon. In season 6, episode 10, “Applejack’s ‘Day’ Off,” Applejack and Rarity try to have a relaxing time at a spa. However, Applejack ends up fixing a leaky steam pipe instead. In order to do so, she needs her tools, which leads to a sequence where she equips her tool belt, tools, and safety goggles in close-up, like the superhero preparation motif. Then Applejack is shown striking a regal pose in front of a blue background. Applejack successfully fixes the leaky pipe and is shown a hero for it. As such, this is presumably a positive portrayal of STEM use in MLP, and – perhaps coincidentally – references the sociological leaky pipeline. However, it is undermined by the fact that Applejack fixed a leaky pipeline in a spa, which is associated with stereotypical feminine interests. While *Friendship is Magic* has such instances throughout the series, it is not something Hasbro clearly emphasizes with the playsets. While there are TinkerToy kits, where you can actually build one of the ponies from *Friendship is Magic*, there are no sets featuring Applejack with her

construction tools or the pony version of Twilight Sparkle in her science lab. As such, *Equestria Girls* seems to be the only recent MLP line to intentionally promote STEM in their media and toy sets. This STEM representation may be a part of Hasbro's hopes for *Equestria Girls* to expand the fan experience of the brand (Schmidt, 2013b). In the next section, I delve into the cultural context of *Equestria Girls* to better understand the creation of and popular initial response to Hasbro's announcement.

Cultural Context of *My Little Pony: Equestria Girls*

When *Equestria Girls* was first announced, there was speculation as to why Hasbro was developing an alternate universe where the ponies looked like humans. Indeed, the announcement received querulous and mixed responses. One article claimed in the headline that the creation of *Equestria Girls* was a "Triumph of the Bronies" because they "have expressed a strong interest in seeing the Ponies in sexy, humanized forms" (Marcotte, 2013, para. 5). Marcotte's assertion seems less wild when considering that even *The New York Times* reported on Hasbro's expansion into a lifestyle brand for Bronies (Schmidt, 2013a). Yet, many Bronies were actually disapproving of the new series calling it "overly girly" and "really feminized" (Connelly, 2017, p. 151). Some mothers were concerned that the human looking ponies could give their daughters unrealistic beauty standards with their short skirts and tiny waists (Pesce, 2013). An article for the *Huffington Post* described the *Equestria Girls* as "My Little Pony meets Barbie" (Driscoll, 2013).

Hasbro, on the other hand, professed a very different view of their new series. Meghan McCarthy, the head writer for the first *Equestria Girls* film, said the series was meant to be "an extension of [My Little Pony's] mythology" (Schmidt, 2013b, para. 6). John A. Frascotti, chief marketing officer for Hasbro, said that *Equestria Girls* was a response to fans' desires "to

experience the brand in more ways” and as “a major strategic initiative” for Hasbro (Schmidt, 2013b, para. 4-8). Either way, Equestria Girls has done well enough to have a new YouTube series announced by Hasbro in 2017 (Orsini, 2017). A review from *The Mary Sue*, a popular culture review site dedicated to women’s representation, stated that “kids and die-hard *My Little Pony* fans will dig the series” (Jusino, 2017, para. 7). Unlike *Friendship is Magic*, *Equestria Girls* clearly markets more directly to women in STEM with the My Little Pony Equestria Girls Minis Twilight Sparkle Science Star Class Set which accompanies the *Twilight Sparkle Science Fair Sparks* chapter book. Additionally, on Hasbro’s My Little Pony website, Sunset Shimmer’s favorite class is listed as “maths,” Twilight’s favorite class is “chemistry,” and Fluttershy’s favorite class is “biology” (“Equestria Girls,” 2019). As such, *Equestria Girls* media products are worthy of analysis for determining the quality of its scientific content.

Problematic STEM Messaging of My Little Pony: Equestria Girls

For this chapter, I analyzed over 11 hours of animated material and one book. The animated content includes the following: three approximately seventy-five minute films, *My Little Pony: Equestria Girls* (2013), *My Little Pony: Equestria Girls: Rainbow Rocks* (2014), and *My Little Pony: Equestria Girls: Friendship Games* (2015); the less than three minute promotional short for *Friendship Games* “The Science of Magic”; three forty-four minute specials, including *My Little Pony: Equestria Girls: Legend of Everfree* (2016), *My Little Pony: Equestria Girls: Forgotten Friendship* (2018), and *My Little Pony: Equestria Girls: Rollercoaster of Friendship* (2018); the mini-series *Tales of Canterlot High* (2017) containing three interconnected twenty-two minute episodes; and a roughly three minute short part of season one of *Equestria Girls* digital shorts, “Twilight Sparkle’s Little Shop of Horrors.” Moreover, I analyzed the 167 paged, kids book *My Little Pony: Equestria Girls: Canterlot High*

Stories: Twilight Sparkle's Science Fair Sparks, written by Arden Hayes and published in 2018. Each story features the main group of humanoid girl friends: Rainbow Dash (blue skin, rainbow hair), Twilight Sparkle (purplish-pink skin, navy blue hair with a purple and pink streak), Fluttershy (yellow-skin, pink hair), Applejack (light-orange skin, yellow hair), Rarity (the color white skin, purple hair), Pinkie Pie (pink skin, curly pink hair), and Sunset Shimmer (former pony, now girl with orange-skin, yellow and red streaked hair).

The *Equestria Girls* media features STEM more prominently and explicitly than *Friendship is Magic*. *Equestria Girls* is Hasbro's most direct MLP foray into promoting STEM for girls, however it also is fraught with messaging that undermines truly progressive goals and reinforces the leaky pipeline. In particular, My Little Pony: *Equestria Girls* media promotes traditional gender roles by associating STEM with feminine values, showing girls as dangerous STEM users, and portraying pretend science rather than real science, while also promoting neoliberal market values such as individual self-promotion and materialism in relation to STEM use. Together, these messages reinforce girls' and women's concerns about STEM fields, explaining why such media does little to fix the leaky pipeline.

Traditional Gender Roles

While the specific promotion of girls in STEM has not always been associated with MLP, MLP has almost always depicted problematic STEM practices. In *Friendship is Magic* and *Equestria Girls*, these depictions have become more intentional. In fact, *Equestria Girls* is even more specifically designed to push girls into STEM. However, despite being more intentional, these depictions still reinforce traditional gender roles, particularly, feminized STEM practices, showing girls in STEM as dangerous, and promoting science that is not real and therefore, more like play.

Feminine STEM. *My Little Pony: Equestria Girls* typically mixes STEM use with the main tenets of girl culture and feminine gender roles. In terms of girl culture, the texts typically link STEM with rock/pop bands, parties, and stardom, with a special emphasis on fashion. In terms of feminine gender roles *Equestria Girls* emphasizes cooking, heteronormativity, and loss of female agency.

Equestria Girls connects STEM to girl culture in terms of parties, music, and stardom, quite frequently throughout its media content. For example, throughout the movies Pinkie Pie, who is her truest self when she is throwing parties so everyone can have fun, has two party cannons. Shaped like old timey cannons, they are colored pink and shoot sparkly confetti everywhere. Additionally, the science fair project Twilight is working on in *Twilight Sparkle's Science Fair Sparks*, with a male partner who came up with the idea, is a machine that is supposed to make people more willing to dance at parties. Another running theme is the use of musical instruments by the main characters' band, the Rainbooms, whose main goal is to bring people together through music and fun. In fact, in *Science Fair Sparks*, the Rainbooms record a new song for the machine Twilight is making to help inspire crowds to dance. Their instruments are also a way for the main characters to channel their friendship magic which causes them to 'pony up'. When the girls pony up they grow pony ears and their hair lengthens so it looks like they have a pony's tail. Additionally, Fluttershy, Rainbow Dash, and Twilight Sparkle now have wings sprout out of their backs, similar to their pony counterparts who have wings in Equestria. They can then combine their powers to create that cornerstone of girl culture, a powerful unicorn. In "Movie Magic", episode 2 of *Tales of Canterlot High*, the main characters are featured on a movie set to assist a popular director in making the next *Daring Do* film, a highly popular series in their world. While it may be somewhat debatable if the main characters are

striving for stardom, they are still participating in the culture that up holds stardom as a desirable achievement in girl culture.

Equestria Girls promotes fashion most prominently in relation to STEM and girl culture. In *Friendship Games*, Twilight Sparkle, who has always lived in the human world, creates a scientific device that can detect and capture magic. However, it takes the form of a fashionable amulet necklace the Equestria Girls can wear. In *Legend of Everfree*, Twilight knows a lot about gems, which is technically geology. However, in this case, it is geology focused on sparkly gems, not actual science. According to Kearney's (2015) taxonomy of sparkle, gems would fall under the less subversive category of adornment. Later, the gems, which are otherwise a natural phenomenon, give the main girls (referred to as the "Mane 7" by Hasbro and in fandom) additional magical powers and are worn by the main girls as fashionable necklaces. The book cover of Twilight Sparkle's Science Fair Sparks simultaneously promotes science with scientific cover art like the atomic symbol, test tubes, beakers, and a rocket ship. However, on the back cover, there is also a blurb which invites readers to "channel your inner Twilight Sparkle with fun fashion tips inside!" (Hayes, 2018). Once you finish the book, which centers around a science fair, "Twilight Sparkle's Signature Style" section is only a page turn away. The section starts out declaring, "Twilight Sparkles is the queen of geek chic" (Hayes, 2018). The section continues with 14 more pages describing each of Twilight's signature clothing items and activities that invite the reader to design an outfit for Twilight and various other shopping and fashion related activities. Additionally, these pages are done all in purple, which is one of Twilight's primary colors, but it is also the color after pink most associated with girliness.

Similar to *Barbie*, *Equestria Girls* also depicts the typically female role of cooking in relation to science. In the *Friendship Games*, the hard science of a chemistry class is juxtaposed

with the traditionally feminine subject of a cooking class by showing the main characters in both classes. Cooking certainly is a form of chemistry but the show is not progressive about this fact because it does not emphasize the science behind cooking. Instead, it juxtaposes cooking and chemistry by showing the main characters participating in each class side by side in a kind of montage. This juxtaposition of the hard science of chemistry with cooking implicitly associates cooking with science. While cooking does involve scientific principles, it is generally thought of as a traditional women's role. Thus, even the scientific girl in the show is portrayed as tethered to traditionally feminine roles of being in the kitchen.

Heteronormativity is particularly emphasized as a subplot of *Twilight Sparkle's Science Fair Sparks*. In the book, Flash Sentry feels jealous of Twilight and her science fair partner. This subplot inherently supports heteronormativity in relation to STEM because Flash normalizes the idea that opposite sex science partners may be inherently meant for each other when he thinks "maybe he was meant to be Twilight's science fair partner, and they'd date and be happy together" (Hayes, 2018, p. 47). Thus, Flash is not allowing for the possibility that Twilight and her science fair partner, Rising Star, can just be friends. On the other hand, the story itself does little to dispel the notion as Twilight seems to be developing a crush on Rising Star. Additionally, the back cover summary states "Twilight falls under his spell" (Hayes, 2018).

Finally, the way *Equestria Girls* content feminizes science for girls is sometimes even dangerous; while connecting the science to more feminine objectives – like cooking and dancing – female agency is occasionally erased or downplayed altogether. The book, for instance, tells a troubling tale of the loss of female agency. During her science fair project, Twilight thinks she is working on a device that allows people to shed their inhibitions and dance. However, it is later revealed that Rising Star intended to develop a machine to manipulate and brainwash the

students of Crystal Prep into being nicer. The story seems to be about Twilight's science skills being hijacked for the purposes of a male colleague. At some level, the story is about strengthening female agency, as Twilight reclaims the project and decides to continue inventing a machine that influences people to be more inclined to dance. The message about agency, however, is muddled by the purposes of Twilight's machine. Even though Twilight and her peers are insistent their machine does not actually manipulate anyone who does not already want to dance, the machine can be portrayed as removing inhibition, in a similar manner as alcohol. Consequently, the question of agency with regards to those who are influenced by the machine is problematic. Thus, while connecting the science of machine making to something as feminine as dancing at a party, the book indicates that losing one's inhibitions is the way to have fun. At the very least, the story suggests girls and women should relish losing control, a message that is antithetical to working in a STEM field that is dominated by men. Even worse, the theme seems to put women in the same subservient positions to men in their lives, and possibly more dangerous situations in real life that can make working in a male-dominated field undesirable.

Dangerous in STEM. Much of the STEM portrayed in *Equestria Girls* is depicted as dangerous. Admittedly, most of what makes it dangerous is the mixing of STEM and magic. Nevertheless, girls interacting with STEM is portrayed as a potentially dangerous combination. This depiction plays into a common stereotype of women in STEM fields as being incompetent, incapable, and hazardous (Colatrella, 2011).

For example, a short, "The Science of Magic," has been created to promote *Friendship Games*. The short depicts Sunset Shimmer using scientific devices to determine how the girls' pony up magic works in the human parallel world. To do this, Sunset hooks her friends and their instruments to various machines that are meant to produce useful data. However, the process

goes horribly awry and Sunset is often injured. Sunset starts her experiments with Fluttershy. She puts a helmet on Fluttershy while she plays her tambourine, which causes the machine to show a butterfly picture on its screen, which eventually escalates into Fluttershy's helmet flying off and the room going dark. When Sunset Shimmer tests Applejack with her bass, magical apples come shooting out and knock Sunset over. In another research attempt, Sunset Shimmer hooks Rarity and her keytar to electrodes, Rarity starts to fly, causing Sunset to trip and fall on the chords. Pinkie Pie plays her drums hooked up to another machine, which eventually generates enough energy that Sunset is electrocuted and thrown across the room by Pinkie Pie's magic balloons. Finally, Sunset decides to test her final subject, Rainbow Dash, while behind safety glass. However, Rainbow Dash's magic travels through the chords hooked up to her electric guitar and causes a rainbow explosion to go off in the room where Sunset was supposed to be safe. At the end of the short, a bedraggled looking Sunset, with wild hair, burnt lab coat, a scratched face, and smoke coming off her dejectedly announces to her friends "I've come to the definitive conclusion. I have no idea how magic works in this world," then faints (Hasbro, 2015). Clearly, trying to study magic scientifically is a dangerous endeavor for the scientist, but these comedic scenes also suggest an incompatibility between girls and science altogether.

In *Friendship Games*, human world's Twilight Sparkle makes a machine that can detect magic. However, her device has the unintended effect of sucking magical energy up as well. For example, when Twilight leaves Crystal Prep to investigate Canterlot High she ends up trapping the main girls' powers in her amulet. Unfortunately, Twilight even sucks up the magical portal between Equestria and the human world. The magic ends up being too much for her device, so it dangerously spits portals randomly to different parts of Equestria. When Twilight tries to harness the power, she is turned into a scary harpy like creature called Midnight Sparkle, who terrorizes

the school with her new magic. Sunset Shimmer rescues Twilight and her friends' magic from the device to ultimately save the day. The effort of detecting magic is yet another example of a well-intended STEM endeavor becoming dangerous, further suggesting that femininity and science are truly mutually exclusive.

This theme of girls being dangerous in STEM fields resurfaces time and time again in *Equestrian Girls* content. In *Legend of Everfree*, the Rainbooms and their school friends are constantly trying to fix an old dock at Camp Everfree, where they are staying during a field trip. However, in the process the dock is destroyed a couple of times. Particularly notable is the second destruction of the dock depicted in an after credit scene in which Pinkie Pie uses her new magical powers to create giant exploding balloons. Thus, the dock repair project that the Rainbooms and their peers have been working on throughout the movie is ultimately destroyed during the end credits.

In *Rollercoaster of Friendship*, magic mixes with Vignette Valencia's phone and allows her to click a picture of anyone or anything and replace it with a digital simulation version that is exactly the way she wants. Vignette is in charge of the opening day parade for the new Equestria Land theme park. Though the technology is in the hands of a more obvious antagonist this time, her issues are depicted in terms of perfectionism taken to the extreme. With her phone, she ends up zapping and replacing several of the Rainbooms who are there to perform for the parade held for the park opening. The girls are zapped to a void-like all-white room, where they are trapped. While nothing inherently life threatening occurs, Vignette does ruin the parade in her endeavor to make it perfect. Her magical phone heinously zaps a person and replaces them with a fake digital version. Again, another girl is portrayed as being bad at something scientific.

Finally, although the perpetrator is technically male, Flash and Twilight's friends believe Rising Star is using Twilight to create an evil brain washing machine for the science fair in *Science Fair Sparks*. As such, the group comes very close to destroying the machine before learning that Rising Star's device was intended to make the students at Crystal Prep nicer. As such, this almost works as an opposite example where in male hands, the technological intent is benevolence and no danger arises. Although a machine that influences free will, even if used for benevolent purposes, is still quite questionable.

Overall, the implication is that girls utilizing STEM may be dangerous, which implies and even demonstrates, in one case, that boys in STEM can have inherently friendlier motives and outcomes. However, most of these examples have involved STEM use when mixed with magic, which I argue in the next section makes any STEM shown in *Equestria Girls* more like play science.

Play Science. While science can be used to find and explain unknown or theoretical phenomena, it seems less like science when it is being used to study magic and more like girls playing at science. These depictions reinforce the idea that women and girls aren't really meant for real science, but only to play at it. For example, the machine Twilight works on with Rising Star for her science fair project is loosely based on scientific research that different music and certain color patterns can affect a person's mood (Gunn, 2002). However, the ability of her machine to remove a person's inhibitions about dancing seems far-fetched.

In a short that promotes the *Friendship Games* and features magic in the Equestria girls' world, Sunset Shimmer is wholly unable to prove anything regarding magic with her scientific tools. However, given the way magic seems to be able to interact with and influence electronic devices, there is an argument to be made that the magic in *Equestria Girls* is a type of play

science in itself. This argument is bolstered by *Friendship is Magic*, the parent show of *Equestria Girls*, in that the pony Twilight in season 1, episode 15, “Feeling Pinkie Keen,” describes magic as something that can be studied and learned, much like scientific theory in our world or practical magic tricks for that matter. As such, *Equestria Girls* seems to follow this trend from *Friendship is Magic* and depicts magic as a kind of “science” that does incredible physics defying feats akin to those in sci-fi shows. However, since it is magic and not actual science, that puts it in the realm of play science, something that requires little actual learning since it is only pretend.

Pretend science surfaces routinely in *Equestria Girls* content. In another short, “Twilight Sparkle’s Little Shop of Horrors,” the watering can Twilight uses has magic all over it which causes the plants to come to life, some even seem to have faces. Twilight is initially excited to be watering the plants for Principal Celestia because she can learn more about botany this way. However, when the plants all come to life they start singing and begging for more water and start to attack Twilight to get it. Twilight texts Applejack for help, and Applejack uses the built in sprinkler system to wash away the magic from the plants and the watering can. Thus, the care of plants and the potential to learn about botany, which is rooted in science, becomes magical and therefore, akin to pretend play science. Reinforcing gender roles of play, *Equestria Girls* constantly emphasizes that girls might be interested in science, but they should not worry themselves to actually understand it.

Neoliberal Market Values/ Consumer Feminism

Obviously, the reasons to develop *Equestria Girls* includes selling more toy sets and related media while attempting to promote STEM to girls. As such, it should come as no surprise that the media itself relates STEM use to the neoliberal ideas of personal advancement and

materialism. The leaky pipeline has been said to exist because girls and women do not see how STEM careers serve their larger communities. As such, *Equestria Girls*' messaging reinforces an image of STEM that makes many seek alternative careers.

Personal/Job Advancement and STEM. In keeping with the idea that technology is dangerous, STEM use is portrayed in a neoliberal light of use for personal advancement. While this use is inherently rebuked in *Equestria Girls*, each character who pushes for such use is generally forgiven, meaning girls could be receiving the message that using STEM for individual gain is fine because in the end you will be forgiven no matter what. Truthfully, the intent of MLP is likely to teach that no one is beyond redemption and everyone can learn and earn that redemption especially with the help of friends. However, given how quickly forgiveness can be given in *Equestria Girls* the message has the potential of being lost. Either way, the portrayal of using STEM for personal use still plays into neoliberal messaging.

In *Friendship Games*, Crystal Prep's principal, Principal Abacus Cinch, inappropriately suggests that Twilight Sparkle help her peers win at the Friendship Games over Canterlot High, with the implication that if Twilight does so, then Principal Cinch will give her a good recommendation on her transfer papers to a fancy math and sciences school. Later, Principal Cinch sings along with the Crystal Prep students to pressure Twilight to use her misfiring magical science amulet to win the Friendship Games. Thus, for the sake of the school's image, Twilight is encouraged to cheat, which ends up being ultimately dangerous to her, her peers, and Canterlot High. In *Rollercoaster of Friendship*, the main antagonist, Vignette Valencia, is using her magicked phone to make everything perfect because she wants to receive the highest recognition for her own success at her job. While both Principal Cinch and Vignette are ultimately forgiven for their actions, as Principal Cinch appears in a later book and Vignette is

obviously forgiven on the spot, both instances purport questionable morals around neoliberal values.

As magic can be viewed as a type of “science” in the *Equestria Girls*’ world, two additional examples of this type of STEM use are seen in *Tales of Canterlot High* episode three, “Mirror Magic” and *Forgotten Friendship*. These instances depict antagonistic characters using magic for personal gain. However, despite the negative light these actions are given, the antagonist is instantly forgiven, which undermines any real critique of neoliberal values. In “Mirror Magic,” the Rainbooms’ new nemesis, Juniper Montage, is seeking revenge for being exposed as sabotaging the next Daring Do movie in the previous episode. Juniper acquires a magic mirror that can suck the Rainbooms into a white void. Thus, Juniper is seeking revenge based on a personal vendetta against the Rainbooms, who are eventually able to use their magic to escape the mirror realm. Once they escape and destroy the magic mirrors’ powers, they forgive Juniper for acting out and offer to be her friends. *Forgotten Friendship* has a similar episode arc where a Canterlot High student, Wallflower Blush, the sole member of the Garden Club, uses a magical stone she found while gardening to make people forget. Sunset Shimmer has redeemed herself. Consequently, Sunset loses her friends. Wallflower Blush’s motivation is, once again, a personal vendetta as she has been consistently ignored by Sunset and her friends. However, Sunset reverses the spell and everyone, once again, offers to be Wallflower’s friend. Thus, even if magic is only really “science” in the logic of *Equestria Girls*, these are examples of STEM being used for personal gain, which are painted negatively. However, the almost instant forgiveness makes the aggressive actions seem more like a faux pas and overlooks the promotion of the problematic neoliberal value of self-aggrandizement.

Materialism and STEM. While no one owns a technologically amazing dream house, there are obvious instances of material wealth in relation to STEM. For example, Pinkie Pie's giant party cannons must cost a pretty penny not to mention the up keep. In *Rainbow Rocks*, all the students in Canterlot High are able to obtain the equipment they need to form various bands. Whether this shows the school as being wealthy for being able to purchase the equipment for their students or that the students are all wealthy enough to purchase their own equipment is not able to be assessed. Either way, it speaks to an implicit level of wealth that is neoliberal in nature, suggesting that hard work helps those interested in STEM acquire material goods, a message that is against the communal goals that tend to drive women to other fields.

In "The Science of Magic," the short meant to promote *Friendship Games*, not only is Sunset Shimmer roughed up during the experimental process but also the school's expensive experimental equipment is damaged. For example, the laptop Sunset is using squirts rainbow magic from its screen. Additionally, an electric overload triggered by the Rainbooms' magic caused an electrical blowout at one point. As such, there is implicit cost in repair work related to the damage done by Sunset's experiments. This is not directly addressed as a concern for anyone present, which suggests a level of wealth or school wealth that goods can be broken and easily repaired or replaced. Thus, the short promotes the neoliberal value of materialism by displaying that material goods, no matter their cost, are easily replaced.

In *Twilight Sparkle's Science Fair Sparks* by Arden Hayes (2018), Principal Celestia suggests to Twilight that once she creates her "next big invention or some great science fair project, no one is going to remember" Twilight's past mishaps which almost destroyed the school (p. 19). While the advice is meant to encourage Twilight to join the science fair, it rings of neoliberal ideas around the idea that success, which comes with the implication of wealth,

puts one above reproach. As such, even if intended as innocent advice, the words still carry implicit values regarding STEM and STEM success that are inherently materialistic in nature.

In the back materials of *Science Fair Sparks*, “Twilight Sparkle’s Signature Style,” not only is the content centered around the consumer world of fashion, but there is even an activity titled, “Time to go to the mall!” (Hayes, 2018, n.d.). The directions for the activity state that you should “fill out your Twilight Sparkle--inspired shopping list!” (Hayes, 2018, n.d.). There cannot be a clearer call for the consumption of material goods. Additionally, part of the back materials includes an ad for a *Friendship is Magic* DVD featuring Applejack. Also, the back cover depicts a small but obvious pitch for the next book in the series, *Rainbow Dash Brings the Blitz*. While this sort of advertising is standard for most book series, attached to a children’s toy or not, it still is a call to buy material goods. This call is out of sync with the legitimate STEM messaging that the story intended to convey to its primary consumers, girls. Thus, Hasbro surrounds its STEM focused media with messages meant to promote materialism via STEM and around STEM.

Conclusion

My Little Pony’s history of trying to promote STEM for girls may be shorter than Barbie’s, but nevertheless they share similarities in the portrayal of STEM that reinforces traditional gender roles and neoliberal ideals. In particular, *Equestria Girls* portrays girls working in STEM to feminine pursuits, dangerous ends, and in unrealistic pretend ways. Additionally, it connects STEM with the neoliberal ideas of individual advancement and materialism. Therefore, *Equestria Girls* works, much like Barbie and Disney Fairies, to normalize portrayals of girls in STEM as excessively girly and promoting consumerism values which can either be off putting to girls who may be interested in STEM careers or give girls

unrealistic ideas about what work in STEM means (Betz & Sekaquaptewa, 2012; Sherman & Zurbriggen, 2014). As such rather than helping to fix the leaky pipeline, these portrayals continue to reinforce the very structures that shape it.

In the final chapter, I discuss in more depth the implications of reinforcing the leaky pipeline, which makes STEM careers seem less available and harder for girls and women to navigate. In particular, I will explore the implications of popular girls brands promoting STEM in terms of traditional gender roles and neoliberal ideals. I argue these portrayals, while ambivalent in nature, seem to have the potential to do more harm than good. Finally, I will present some ideas on how representation in girls media can be used to restructure the pipeline, which would make STEM more appealing and easier for girls and women to navigate.

Conclusion

Leaky Representation: The Failures of Girl Branded STEM Promotion

Girl branded media promotion of STEM is inadequate to the task of addressing the issues that scholars argue make up the cracks and blockages of the leaky pipeline. This failure is due in large part to the way girl branded media reinforces gender norms and neoliberal values in their portrayals of women and girls in STEM. Reinforcing hegemonic gender norms, such as western beauty standards, heteronormative expectations, women's incompetence in STEM, and pretend STEM practices, all work to reinforce limiting ideas about how women and girls in STEM should behave and ultimately that women do not inherently belong in STEM fields. This supports studies showing that overly feminine images of female scientists cause girls to feel even less interested in STEM careers (Betz & Sekaquaptewa, 2012; Sherman & Zurbriggen, 2014). These forms of media also attach STEM to neoliberal values. Thus, the girl branded media inherently supports commercial market driven notions such as industrialization, surveillance, consumerism, entrepreneurship, personal advancement, and materialism that have been proven to discourage girls from STEM fields (Diekman et al., 2010; Diekman, Weisgram, & Belanger, 2015; Saucerman & Vasquez, 2014).

Through three case studies, I have demonstrated that these themes recur in branded media efforts to reach young girls and promote STEM education. In Chapter 1, I analyzed Disney Fairies media. The depiction of STEM in relation to gender norms in these films is primarily through situations that uphold STEM as play, white hegemony, and western beauty standards. Taken as a whole, the series promotes neoliberal market values by prominently displaying instances of industrialization via technological advancement. Chapter 2 focused on the Netflix show, *Barbie: Dreamhouse Adventures*. The show promotes traditional gender roles focused on

feminized STEM centered around caretaking, heteronormativity, and girl culture. Additionally, it promotes neoliberal values regarding consumer surveillance, consumerism, and entrepreneurship in relation to STEM. In Chapter 3, various My Little Pony: Equestria Girls media was analyzed. Overall, these media products promote traditional gender roles in terms of feminine STEM (girl culture, cooking, heteronormativity, and lack of agency), depictions of girls as dangerous in STEM, and feature more play science than actual science. Additionally, and like the other cases, Equestria Girls media primarily focuses on neoliberal market values in relation to personal advancement and materialism.

As I complete this study, it is important to note how my own positionality influenced my work on examining portrayals of gender identity in STEM. Growing up with a primarily middle class background, I have known many of my peers who are women and/or minorities to enter STEM fields. While I have never felt STEM fields were my calling, I have always had an interest in STEM and the opportunity to engage with STEM in a variety of ways. This interest reflects my status as having relatively easy access to STEM information and enrichment at school, at home, and in relation to peers who have gone into STEM fields. Additionally, given my biracial identity, as half-white, half-Asian, I belong to the two largest groups represented in STEM fields. As of 2017, both groups combine to make up 86% of early career science or engineering doctorate holders (National Girls Collaborative Project, 2018). Although, because of my biracial identity, it is likely I would be counted among the 3.1% of other minority women racially underrepresented in science and engineering (National Girls Collaborative Project, 2018). Given the advantages I have had as part of the middle class and my uncertain standing in relation to racial representation in STEM fields, I surmise I come from a privileged position in relation to STEM. This positionality influenced my analysis in that I had to be additionally self-

aware and vigilant of my own personal biases that could stem from my privileged position. In particular, I had to consider perspectives outside those that dominate white middle class and Asian views of STEM. Essentially, this means I had to make sure I considered perspectives outside my own intersectional identity to provide a wider, more inclusive analysis. As such, I hope to bring a broader perspective to the larger implications of my findings.

This study has many implications. The mistake of repeating messages of traditional gender roles and neoliberalism in girl branded media speaks to larger issues within the attempted promotion of STEM to girls. Not only do these restrictive portrayals serve to turn away girls who might be interested in STEM, but also they support larger hegemonic structures that collectively work against the advancement of women and minorities and ultimately our society at large. First, girl branded STEM media promotion of traditional gender roles works to normalize societal structures that inherently disadvantage women and minorities. For example, in the Disney Fairies films, only white fairies are shown practicing STEM. While *Barbie: Dreamhouse Adventures* shows more diversity in girls practicing STEM, the audience still only primarily sees white Barbie and her sisters participating in STEM endeavors. In the world of *My Little Pony and Equestria Girls*, skin color is not meant to be indicative of race (Faust, 2010). However, it is worth noting that all the voice actors for the main characters are white women. As such, these texts implicitly reinforce white hegemony. Therefore, this is unsurprising as these texts are inherently characterized by postfeminism, which comes from a white perspective (Vavrus, 2000).

Beyond the portrayal of gender roles, the neoliberal messaging in girl branded media not only provides examples of messaging that are known to lead girls away from STEM, but that also works to normalize neoliberal corporate culture, which is inherently designed to profit off

the lower classes. The Disney Fairies movies portray industrialization as consequence free. In reality, industrial practices have deeply harmed and, despite common sense attempts to regulate waste and pollution, continue to harm the environment and our health. Owner profit driven industrial practices also strive to exploit workers around the world for cheap labor in poor working conditions. Scenes in *Dreamhouse Adventures* have the consequence of normalizing practices of surveillance in the workplace which are critical to corporate strategies designed to take advantage of workers. Additionally, the show promotes a lifestyle of extravagant consumption by surrounding the characters with the latest and greatest new technology and showing their excitement with every new gadget that is supposed to make some aspect of their lives better. This reinforces cultural messages which inherently ignore the real concerns of constant internet surveillance and a mode of production that concentrates the wealth among only a few members of society. *Equestria Girls* furthers the neoliberal idea of focusing on personal advancement above all else. While the messaging is somewhat ambivalent on this matter, it certainly implies that pursuing goals, no matter the cost, has few serious consequences, i.e., the end justifies the means, a philosophy that has repeatedly undermined otherwise apparently successful civilizations.

Finally, the leaky pipeline itself functions as an imperfect problematic metaphor. Jessica Heybach and Austin Pickup (2017) argue that the metaphor is used to create promotional content formulated to show the benefits of STEM for girls and minorities as individuals, rather than the more radical and progressive notion that girls' and minorities' involvement in STEM may transform these fields by producing less biased experimental designs and interpretations of findings. Another prominent issue with the leaky pipeline metaphor is the idea that the pipeline leaks women, which suggests holes worn by time, rather than specific mechanisms within the

structure that actively push women out of STEM (Pawley & Hoegh, 2011). I argue that a third issue with the leaky pipeline metaphor is that it puts the onus of struggling through its blockages and past its inherent holes on women and minorities who desire to enter the STEM field without taking into consideration that anyone involved in STEM may help to stop the leaks and improve the flow. This idea is reinforced in girl branded media via the promotion of traditional gender roles and neoliberal values. In particular, the traditional gender roles reinforce notions that women should focus on domestic caretaking, such as cooking for the family or tending to children, two skill sets hegemonically deemed to be necessary for wives and mothers. From a neoliberal perspective, these texts reinforce ideology regarding the American Dream as interpreted as pulling oneself up by the bootstraps, which cannot literally be done. As such, if a woman or minority fails to make it through the pipeline successfully, these girl branded stories reinforce the idea that it is no one's fault but their own for not making it. Therefore, rather than STEM representations that function to obscure the inhibiting structural issues of society and that promote isolating individual struggle, it would be more productive to portray STEM in terms of collective action that can lead to impactful structural change.

Given all of these implications, it is worth wondering what kind of STEM outreach would be best. In other words, what are the alternatives to the case studies I analyzed in this project? While it is difficult to hold up a particular contemporary kids show as perfectly promoting STEM to girls, in the following, I will outline some potential improvements to STEM promotion within girls media. First, I believe it would be crucial for girl branded media to focus on actual scientific principles rather than the magical or false science such as is common in Disney Fairies movies, *Dreamhouse Adventures*, and *Equestria Girls*. Shows like *The Magic School Bus* and *The Magic School Bus Rides Again* prove it is possible to portray magic, which

in this case is a time traveling school bus that can go anywhere from inside a human body to outer space, while still teaching real science such as biology and astrophysics. Entertainment and science are not exclusive values. In short, while magic might attract kids to shows, the hard science need not be sacrificed. Secondly, it would be important to tie neoliberal values such as industrialization, surveillance, and materialism to real world consequences such as pollution, invasion of privacy, and consumer fetishism. If so many women turn away from STEM fields because they eventually see them as antithetical to community interests, programming for children might be better served by focusing on how science could be profitable *and* valuable in solving community based problems. Finally, it would be beneficial for such media to address, and even to portray innovative solutions for, the structural obstacles women and minorities face in order to make it in STEM fields. All of the programs I analyzed emphasized that girls are capable of accomplishing anything, but this message sets up unrealistic expectations. Perhaps instead of leading to girlplay, such shows can emphasize why girls feel lost in these fields, why they may drop out of STEM in the future, and how to start chiseling away at those problems. To this end, I believe a return to an emphasis on the symbiotic relationship between the humanities and STEM fields would greatly help.

There are signs such an integration may be occurring with the promotion of STEAM. STEAM looks to integrate arts and STEM learning. However, STEAM runs the risk of framing art solely in terms that ultimately uphold STEM as the end goal. In other words, art could be shown as only valuable because it can help advance someone's career or schooling in STEM. Yet, there is also the potential that the integration of art with STEM may lead to an empathetic approach to solving structural issues. One study found that integrating STEM and art led students and teachers to consider the human side of technical problems that face society as a whole

(Sochacka, Guyotte, & Walther, 2016). Therefore, I surmise there is hope for further integration of STEM practices with the humanities in order to more wholly address the multifaceted structural issues that plague society. As such, the best way to fix a leaky pipeline may not be to patch the leak but to restructure the pipeline.

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