Gender-Gaps, Gender-Based Social Norms, and Conditioning from the Vantage Point of Leadership Theories

Kim Lewis
DePaul University - School for New Learning

Introduction

There is a disparity between the ideal world and reality. Ideally, women would have equal pay, equal recognition for the same effort of work, and equal opportunities as our male counterparts. The reality is that only 18% of computer scientists are female as revealed in 2015 by the National Science Foundation (nsf.gov). However, Beckman and Ober (2012, p. 50) reveal through research that female adolescents with high-math scores are positioned to pursue STEM careers. The authors iterate that STEM gender-gaps can be decreased through educational and parental guidance. The Obama Administration put forth a call to action in order to bridge the gap. And society has begun to answer that call. According to the Office of the Press Secretary from the White House in March 2015, a record number of female adolescents participated in the White House Science Fair. However, if only 18% of Computer Scientists are female in 2015, this suggests that there is an unimaginable lower figure for female leaders in this field. Gender-gaps in leadership roles must be adequately addressed by integrating leadership programs and mentoring throughout STEM mentorships, STEM immersion programs, and STEM internships.

This summary of findings will explore theories and models of learning development through analysis of social norms and conditioning in order to identify strategies for implementing systematic change in leadership structures for female adolescents between the ages of thirteen and eighteen. The guiding purpose of this paper is to reiterate that gender-gaps exist, more particularly in leadership fields of STEM-based positions. This paper begins with highlighting social norms in adolescents as observed during STEM events yet reveal how math scores reveal that girls are ultimately positioned to pursue STEM-based careers. In narrowly focusing on a solution to fill the STEM pipeline by encouraging female adolescents to pursue STEM courses, it opens the door to another crisis: females are filling STEM-based fields, but there are limited career options beyond middle management. Secondly, this paper reports statistics on leadership gender-gaps, aligning the gaps in leadership to the same social norms that contribute to gender-gaps in STEM-based fields. And lastly, specific tools are highlighted to identify leadership traits and strategies for nurturing leadership skills for female adolescents within STEM immersion programs.

Gender Gaps & Gender Bias

In attending multi-gender youth STEM events and girls’ STEM events, comparable differences in girls could be observed at the former versus the latter. Fifth grade female adolescents attended a yearly girls STEM event held by the American Association of University Women (AAUW). During this event, the adolescents allowed their curiosity to guide them to delve deeply into project-based learning through well-thought out questions by connecting with authentic experiences. Comparatively, there were some cases of gender-divide at the Chemistry Industry Council of Illinois’ (CICI) annual two-day STEM event which was held at the Museum of Science and Industry. There was evidence of girls shying away from tables where boys and young men dominated the engagement at the engineering tables. However, there was strength in numbers.
Where there were three or more female adolescents, the intimidation was overcome by the number of girls supporting each other. Additionally, CICI engaged all of the students through quizzes, company exhibits, and STEM treasure hunts to challenge students to find answers in all areas of STEM. Overall, the students immersed themselves in the exhibits and competitions. Consequently, this particular event lends itself to match-making opportunities for mentorships and internships as a new social model, as it will be explained more later in this article.

Social models are instilled in children at an early age. When children were asked to draw pictures of scientists or mathematicians, they generally drew pictures of men (Betz & Sekaquaptewa, 2012, p. 739). Social models reflect men leading corporations, departments, and teams. As part of identity development, female adolescents have not traditionally been immersed in the belief that she can be the president of a company, the CEO of a corporation, or the director of an Information Technology Department. As a result, these socializations of “male leadership” are internalized and we (women) have carried this defining belief.

According to Allison Master, Sapna Cheryan, and Andrew Meltzoff female adolescents do not believe that they belong in stereotypical fields and as a result, do not actively pursue classes in computer science (2016, p. 431). However, after designing a social experiment in which the stereotype was removed, the number of female adolescents interested in computer science classes increased, proving that stereotypes influenced their decision-making when selecting courses. In modeling this experiment, educators should consider offering incentives that would encourage adolescents of any gender to not only participate in STEM programs, but also vary the tasks in STEM project-based learning to identify different leadership traits within each individual participant. “Project-based learning is a teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an authentic, engaging, and complex question, problem, or challenge” as defined by the Buck Institute of Education.

Another study conducted by Beekman and Ober (2012, p. 43) through multi-regression analysis indicates that the gender-gap for female adolescents in math will decrease. Ultimately girls outperform boys (particularly in eighth grade). The exception to this analysis is in schools with a higher percentage of Asians or a diverse student base. The gender-gap increases in these environments. However, based on the projected need in the U.S. for STEM-based careers, educators, parents, and counselors should encourage female adolescents to pursue foundational courses for STEM-based fields which in turn will provide them with leadership options that they might not otherwise have.

Leadership Roles

Today the demand of STEM jobs created outpaces the supply. Organizations throughout the world have begun to create diverse and rigorous STEM programs for adolescents. This call to action has highlighted underrepresentation of women in STEM, and in particular, women of color. As schools, businesses, and community organizations began to develop foundational programs in STEM, diverse leadership was not at the forefront of this call.

Women in Technology International (WITI) sponsored a survey report which was conducted by 451 Research (2016). The report revealed that although female students have made gains in certain STEM fields, out of 1,100 women surveyed, only 13% of them were department chairs or held positions at senior levels (p. 2). Women in U.S. Management indicates that only 15% of
women hold Fortune-500 board seats and corporate office positions as reported by Ely, Ibarra, and Kolb (2011, p. 474). And women of color represent only 3% of board and C-level positions. These statistics reflect that as a woman climbs the corporate ladder, the smaller percentages become for female leadership, leaving her with few resources for networking and collaborating. While the STEM pipeline is being filled, there is a growing pool of untapped STEM leadership talent. This leads to question what happens to a woman’s STEM career trajectory when she envisions more for herself than middle management. Fields of opportunity are unfolding in STEM and there is no better time than now to take steps to fill senior level positions.

Just as gender-gaps are cross-national, leadership gaps exist disproportionately world-wide, as well. In Europe only 1.8% of CEOs are women and India have 11% of women representation of CEOs (Ely et al., 2011, p. 474). Anne McDaniel (2015) identifies the cross-national gender-gap trends as it varies from one country to the next highlighting the disproportionate leadership alignment in STEM-based fields. McDaniel underscores that women have made significant progress in most labor markets but that women continue to be underrepresented in STEM fields. The gap in the STEM-based field of Computer Science leads to question that if there is an overarching relationship between the gap in STEM leadership and the gap in all STEM-related classes through socialization.

In industries where men have dominated career paths as within engineering, it becomes particularly difficult for woman to navigate an upward path in an environment where men have traditionally collaborated, socialized, and supported one another. One quandary is that once the door for women is opened to an engineering career, there is no change in policy as to how promotions will be handled. The workforce supply has changed but the policy has not. As the world grows and change, company policies and training needs should continue to evolve just as dynamically as society does.

As the need for STEM workers are filled, increasingly so, the need for female leadership must substantially shift the status quo in leadership. The complexities of global growth and competition require rigorous solutions. In order to compensate for the gender-gap in the workplace, integrative leadership processes are necessary within programming of STEM fields not traditionally held by women. Educational organizations must immerse female adolescents in STEM leadership programs for girls to ensure that leadership becomes embedded within those that have leadership potential.

If we become what we see, role models are indeed necessary to encourage young women to pursue leadership positions that are worthy of their skills and talents. What we see today is women underrepresented at senior levels. 451 Research’s survey report also revealed that only 8% of those surveyed had mothers who worked in STEM fields compared to 50% with father role-model figures. And only 30% of those surveyed knew of a woman working in STEM while growing up other than their own mother. Lack of female role models is a subtle inference to the self-identity and relational process necessary to become a leader. DeRue and Ashford (2010, p. 641) show that internalizing self-identity is a part of the process to becoming a leader. Identity work begins with female role models who model success and this opens avenues of success for others.

As a new social model for youth, more than half of CICI’s exhibitors at the STEM event had women representing the companies. One company, Carus Corporation/Sierra Chemical was almost fully-flanked with female representation on the first day of the STEM event. As a result, female adolescents engaged longer at these tables. However, when speaking with a woman from a different company, she said that there were only two female employees at her chemical company.
The caveat, however, was that the company asked both women to participate as they too were helping to encourage girls through role model identification.

WITI and Will Marré have partnered for the past several years to bring transformational programs to corporations. Marré’s states in his article, *Why Women Need to Lead*, that women’s brains are wired differently from men according to brain research and his years of developmental research in working with corporate C-Levels (CEO, COO, etc.) The culture of business resides in the orientation of the male brain. A single woman at the same level of leadership can face many challenges as the strengths of female thinking goes against the status quo. Marré’s leadership research has revealed that teams with at least 30% women produce better results including profitability and growth over one-gender teams. In line with this, Microsoft recently tweeted: when we encourage girls to pursue STEM, we double our potential for innovation. The theory then is that diverse teams produce diverse and innovative results, thereby enhancing the systems that power our economy through shared prosperity.

**Tools & Practices**

*Raising Awareness*

Society dictates practices and social norms. The key to transcending poverty and gender barriers is two-fold: education and mentoring. Both are pivotal in providing a platform for female adolescents to continue to propel advancements for women. In identifying gender barriers to female adolescents, once awareness has been raised of the subtleties of gender bias, research confirms that women are less susceptible to gender-bias practices (Ely et al., 2011, p. 488). The key is to introduce the strategies in STEM immersion programs before a female adolescent engages in internship programs. Through internships, interaction with real-life dilemmas will help to sharpen the skills and create new social norms.

*Mentoring & Racial Socialization*

Critical Race Feminism (CRF) is a framework that can be used in gender and race assessments. Larke, Webb-Hassan, and Jimarez (2014) looked specifically at third and fifth grade female adolescents to study their achievement and how it predicts STEM-based career paths. Using test results from the Texas Assessment of Knowledge and Skills (TAKS) to analyze raw data for identifying lack of preparation for girls of color, Larke et al. (2014) highlight racial oppression within gender oppression as a social norm. Grossman and Porsche (2014) researched how students were able to overcome barriers in urban settings. Students credited the mentoring of teachers and parents in helping them to cope with perceived micro-aggressions, which in itself can contribute to a healthy development. Recommended interventions and support can bolster STEM engagement as it relates to gender and race to help diversify the STEM workforce.

In holistically mentoring a child, to what extent does leadership in the home shape a child’s vision? Srtnic-Pawl and Leffler (2011) divulge leadership traits that are common among the African-American family. There are three distinctive traits: 1) extended and fictive kin, 2) racial socialization, and 3) education. From 1910 through 1970, these three traits have transcended time. This research includes African-American leaders ranging from a Chief Operating Officer to Dramatists and Poets, from political leaders to military officers. Their family circles extended beyond the walls of the households to the community and church, which instilled a sense of expectation and leadership requirements within the African-American youth. Although the American Dream is a vision worthy for all to strive for, being African-American in the United States connotes developing approaches to handling discrimination at any intersection of life. These are lessons that can only be learned from the more experienced to the lesser experienced as racial
social engagements shift dynamically to adjust to current social needs. And lastly, education has been highlighted as the foundation to fulfill any vision. The theoretical framework reframes the African-American population using the three leadership traits of the African-American family. Each leader credits these three traits as contributing factors to his or her success as a leader.

**Motivation & Measurement**

It is important to meet every youth where she is in her educational walk. In creating a program, Crow and Whiteman (2016, p. 124) contend that there is little correlation between a student’s GPA and whether they will complete a program or not. In setting admission criteria, administrators should carefully consider the screening requirements necessary to identify leadership traits such as flexibility, communications skills, and critical thinking. In identifying and measuring leadership, there are several instruments that can be used for measurement through various tools such as *The Gifted Education Scales* and *The Eby Gifted Behavior Index*, just to name two (Shaunessy and Karnes, 2004). There are different approaches, though over a half-dozen instruments that can be used to measure a particular age-group and/or perspective (teacher versus student), with many of the instruments accepted as leadership indicators today. As of 2015, the Ohio Department of Education developed a fact sheet based on the instrument Scales for Rating Behavioral Characteristics of Superior Students (SRBCSS). Beyond admissions, adolescents also can use self-assessment evaluations using other instruments such as Myers-Briggs Type Indicator (MBTI), and Leadership Skills Inventory (LSI) to identify traits within him or herself. Based on Carl Jung’s theory of psychological types, MBTI helps individuals discover their personality type and this in turn helps to plan careers and choose subjects to enroll in at school. LSI is a self-rating tool that assesses nine different areas including written communications, speech communications, and character building. Additionally, members of Research Gate recommend LSI as an instrument for measuring leadership skills.

It is just as important to note, that the strategies outlined here are guidelines as retrieved from the empirical findings by Crow and Whiteman (2016, p. 121) which indicate that the best approach to effective leadership preparation is to tailor each program to the local needs of the school or community. While many have used the approach to identify high-potential people and later provide them with mentoring, it is worthwhile to consider an alternative leadership development approach: motivate first because it reveals talent.

**Purpose & Relationships**

In developing leadership strategies for women, Ely, Ibarra, and Kolb (2011, p. 475) iterate that current models of “adding women, then stir” methodology does not work because of the assumption that gender does not play a role in leadership. They also highlight the opposite extreme of “fix-the-women” approach impedes integration as it suggests that the problem is the woman. The vision for parity requires a sense of agency in women which needs to be synthesized in female adolescents by creating new social norms. Ely et al. also states, “Leaders are most effective when they pursue purposes that are aligned with their personal values and oriented toward advancing the collective good.” Unfortunately, when leaders only focus on ways to advance their own career they miss the mark. Other pursuits that disconnect leaders from core values blur the bigger picture. Transparency is lost and people do not see the leader as authentic. It is critical to maintain focus on a purpose that can be shared with others. If a leader is concerned with how they are coming across to others, “they divert emotional and motivational resources form the larger purposes at hand.” (p. 479). Internalizing a leader identity and developing an elevated sense of purpose
contributes to a person’s authenticity to strive for a goal greater than them. A basic human need is to be in relationship with others. Yet when one’s purpose helps society or the greater good, the pursuit becomes a reward to the individual and the group. This strengthens the bonds between group members. Additional benefits include inspired trust, increased sense of urgency in others, and greater meaning in work.

**Reflection**

Theoretically, immersion in STEM leadership programs will help to shift cultural beliefs of women’s roles in society. The experience of female adolescents from these programs creates subtle yet expanding impacts throughout their relationships and future experiences. Women’s leadership programs help to diagnose their experience in the workplace as it relates to gender bias. Using this concept as a model, STEM immersion programs with leadership protocols are intertwined. The sooner that a female adolescent begins to conceptualize leadership as part of her identity through reflective development, the more embedded and dynamic her leadership abilities become. Several authors confirm that the ability to self-reflect on personal experiences provide individuals with the necessary critical thinking skills that help them to become more agile in diverse situations. Ely et al. (2011) argues that all leaders face many of the same challenges, regardless of gender, but must adapt to their leadership role through self-reflection and organizational diagnoses. Reflection is a proactive process that constructs meaning for the leader by elaborating on social reactions and the leader’s interpretation as stated by Hogue and Lord (2007, p. 371). However, for the reflection to become truly useful, feedback is necessary in order to create a dynamic method to expand as the adolescent matures.

360 Degree Feedback is a tool that allows individuals to receive feedback about her strengths and weaknesses. Through this process, an individual can take the next steps to maximize strengths and minimize what others consider weaknesses. Nonetheless, 360 Degree Feedback would best be handled in a safe environment where criticism is guided through a collaborative team effort and individual agency in learning is encouraged by the group. Within leadership programs, adolescents are randomly divided into groups. The groups are assigned projects through project-based learning for team building skills. 360 Degree Feedback should be integrated within each group thereby giving each member added incentive to provide constructive criticism throughout the project as the goal is to develop the project and the team. The goals of the project give focus to the team and extrapolate each person’s leadership traits.

**Fluency and Agility**

While experimenting in project-based learning through leadership integration, leadership identities will continue to emerge and develop. Just as new hires learn best when immersed in real-world situations to fully understand the work environment, or foreign exchange students learn best when immersed in a new culture with a different language to become more fluent, the same holds true for identity development in leadership. Every student would encompass a different leadership style. The best way to identify and nurture identity development is through immersion. This creates fluency in leadership as the student relates what they learn from within the program to real-world situations. DeMeuse, Dai, and Hallenbeck (2010, p. 124) point out that agile learning is a key indicator to future leadership success. Agile learning is “the willingness and ability to learn from experience and subsequently apply that learning to perform successfully under new or first-time conditions.” The concept of learning for leadership fluency is introduced through team challenges within STEM programs to draw out varying traits of leadership in adolescents. Through leadership
experience in STEM programming, the ability and flexibility to learn and grow from past experience creates successful agile leadership at an earlier age. While making mistakes is to be human, the transparency in admitting the errors and taking steps to correct the mistake is seen to be authentic. Authenticity is a leadership trait that followers respect, and this creates a positive leadership experience. To continue to be successful, leaders need to be change, adapt, and be seen as authentic. The sooner female adolescents begin to embrace these leadership traits, the more agile and fluent they become.

Just as project-based learning or design-based learning afford youth the luxury of experimenting and learning that failure is just another learned outcome, the same holds true for developing leadership skills. In this, the transformation is not task-oriented but developed from the inside out, providing youth with some hands-on experience and critical thinking development. Perez, Uline, Johnson, James-Ward, and Basom (2011) as reported by Crow and Whiteman (2016, p. 132) iterate that after interns had garnered some experience, they were more prone to lead.

Play

Notwithstanding the importance of goal-setting and strategic planning, every student-leader needs to understand the importance of play within work. It’s the pulsating cycle of intense work then release through play that stimulates creativity and new forms of thought. In observing a fourth-grade STEM program, the students were instructed to create a prototype of a car. They were to create a budget, design the prototype, purchase parts within budget, build the prototype, and then test the car. All of the children were told to have fun while they were designing and building their prototypes. The two girls’ groups were detailed. They studied and adhered to the printed instructions of how to design and build. They completed their prototypes first. However, two of the three groups of boys took time to play. They explored different ways of designing their prototypes. I remember all of the children being active in that they would work at their laptops for a while, they would go to their stations to design, and then ask the teachers questions.

One of the boys’ groups designed their prototype with a sunroof. Another group of boys exhausted their budget and needed to purchase more parts. The teacher told them to work within their budget and to re-engineer their prototype. That group created a three-wheeled motorcycle. And the third group of boys had one independent designer who used the excess parts to build a chassis for an additional prototype. While the girls finished first, the boys’ prototypes were more interesting and fun. Where was the creativity for the girls? Dr. Stuart Brown states at some point people begin to feel guilty for playing (2010, p. 6). Through my own reflection, I have heard that girls mature faster than boys. Does this mean that society makes girls feel guilty for playing at an earlier age? Did the girls in the STEM class have fun creating their prototype or did they compete to beat the boys? Brown’s review of play in children’s life also shows that it does affect a person’s life course (p. 26). The absence of play or diminished play in children translated to some going to prison or developing antisocial behavior.

Let them Lead

After implementing uniquely defined strategies as needed by the local school or community, cut the ties and allow students to lead. Just as Covenant United Church of Christ allowed its youth to lead, other organizations have adapted this model. Digital Youth Network (DYN) has a technology-based program centered within Chicago Public Libraries. Once the program was fully developed, the students were encouraged to invite their teachers to visit the libraries so that they could observe the progress that the students were making. In those visits, it was revealed that
students were “technologically” more advanced than the teachers were. It was with this thought that DYN created a model where more experienced youth teach less experienced youth in technology. Similarly, in interviewing Robert Franz after his presentation at STEMCON 2017, he explained that all of his students are agile in speaking and promoting their program. He designed a program for the Southwest Independent School District in San Antonio, TX whereas the students developed the entire Electrophone car program themselves. It started with the idea of creating the car to compete in nationally sponsored races. Along with the primary responsibility of designing, building, and racing the car, students created press releases, and wrote request letters to companies asking for support. The students also invited companies to speak and mentor them. To date, the district has a student PR team, a student development team, a student design team, and they all are fluent in math and science. Each member of the team has the ability to speak fluently of each aspect of the project. As they graduate out of the program, the alumni return to give back as corporate employees initially gave to them. The district has three to four projects a year and is growing beyond the boundaries of their district. Franz underscores that allowing students to take ownership of projects is the key to leadership.

Conclusion

In conclusion, 451 Research’s survey revealed that over 40% of participants want leadership roles. The desire to lead is there. Women want career advancement and the recognition that comes from a leadership job well done. Notwithstanding the accolade of recognition, in speaking to women at STEM events, the reward of giving back through mentoring is immeasurable. This Summary of Findings provides an insight into the strategies that can be taken to begin to reduce the gender-gap by including educational support through encouragement, parental guidance, and embedding visions of leadership in youth today. History has shown that education leads to economic development which in turn equates to financial freedom for women. Through integrating leadership mentoring in STEM immersion programs, this opens the doors of leadership to women. In turn society dramatically increases the opportunity of innovation and new learning through the wealth of untapped economic value of female leadership.

References

@Microsoft. “When we encourage girls to pursue STEM, we double our potential for innovatics” Twitter, 8 Mar 2017, 10:59 a.m., twitter.com/Microsoft/status/839511025807039856
American Association of Women. (2016). 2016 Math/Science Conference for 5th Grade Girls 1 1 s Hills, IL.
Buck Institute of Education. (n.d.). What is project-based learning (PBL)? Retrieved from https://www.bie.org/about/what_pbl


