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STEM and Adolescent Girls

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Where are the Female Scientists and Mathematicians? Promoting STEM Careers in Today's Adolescent Girls

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Abstract

The projected growth of science, technology, engineering and mathematics (STEM) careers is unprecedented (Lufkin, 2009). With the growth of women in the workforce and/or obtaining post-secondary degrees, the projected number of females in STEM fields should increase; however, that is not the case. Recently, the estimated percent of women in STEM careers is less than 30% in the United States ("Has employment", n.d.). The reasons behind this underrepresentation of women in STEM careers includes multiple facets such as: sexist practices in education and workplace, psychological factors that influence the self and career choice and social factors including, but not limited to friends/peers, parents/guardians, teachers and other educators and the media representation of STEM. In accordance to American School Counselor Association's standards for school counselors, school counselors serve as a pivotal role to encourage adolescent girls in STEM. These interventions include institutional and individual changes within the school. Through analysis of interventions and a thorough understanding of the research, a small-group intervention was developed to increase academic self-perceptions in mathematics and science among adolescent girls. Increasing self-efficacy has shown to increase persistence in STEM courses which will increase STEM fields.

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Introduction

Science, technology, engineering and mathematics (STEM) careers are one of the fastest growing career domains in the world. In fact, many STEM careers are predicted to increase anywhere from sixteen percent in some careers to sixty-two percent in others by the year 2020 ("Science, technology", n.d.). The need for individuals in STEM will only increase as all STEM careers are projected to experience an unprecedented growth in the job market. Advancements in STEM fields change the world in numerous, insurmountable ways. For instance, advancements in virology may lead to the development of new vaccines. The growth of aerospace engineers will construct technologies capable of bringing a human life to Mars. Technology develops faster than the world can keep up; the latest gadget is already out-of-date by the time it is advertised and bought by eager consumers. Technology growth connects the world with the spread of ideas, movements and information. Engineering is a vast field with domains in a variety of different fields. Utilized to build efficient tools, machines and roads. Those in mathematics develop equations to solve routine and complex issues. STEM occupations are growing, they are integrative into nearly every facet of a typical day.

Women are underrepresented in the field and the statistics of women in STEM fields is much many other occupational fields. The underrepresentation of women pursuing STEM careers is a worldwide phenomenon (Stoet & Geary, 2018). It is also pervasive across decades of women in the working world. Finland, a country often described as a gender equality pioneer, reports that women comprise of less than 25% of all STEM college degrees (Stoet & Geary, 2018). Statistics reported in the United States in 1970 describe that women only comprised of 7% of all STEM careers (United States Census Bureau, 2011). In 1990, women comprised of 23% of the STEM occupations ("Has employment", n.d.). Recently, women in STEM careers is

approximately 28% (“Has employment”, n.d.). Over the past couple of decades, women flooded post-secondary institutions. Despite, women attending technical schools, colleges and universities and obtaining degrees, women are trickling into STEM occupations. The evidence is apparent that there are still barriers that may hinder and/or dissuade adolescent females from taking STEM courses in high school, university and entering STEM occupations. School counselors working at all education levels, especially middle and high school counselors, serve as a pivotal role to provide support and develop interventions in these settings to assist adolescent girls continue to pursue STEM courses while in secondary school.

The purpose of this project is not only to outline the historical and contemporary context that place barriers on women and girls in the workplace and in education settings, but to also highlight the multiple interacting facets that contribute to adolescent career selection. Further, this project aims to analyze the influencing factors behind why a many adolescent girls do not pursue STEM careers. Through dissecting these contributing factors, one can begin to examine effective interventions to implement within schools to encourage adolescent girls to continue in STEM courses and STEM-related careers. Through utilizing the information regarding contributing factors and effective intervention techniques, this project includes a developed, six-week small group intervention aimed to encourage middle school adolescent girls to continue in STEM courses.

Literature Review

Encouraging young adolescent girls to continue in STEM classes and hopefully pursue a STEM-related career after secondary school involves numerous factors including current and past discriminatory practices girls and women have faced in the work place and educational settings, career choice, social and psychological reasons behind the complexity of the clear underrepresentation of women in STEM. This literature review provides context behind the phenomenon.

History of women in work and education

To fully comprehend the numerous factors that influence one another and direct career obtainment, it is necessary to understand the historical barriers women have faced in the workplace and in educational settings. Before Title VII of the Civil Rights Act of 1964, women were not protected from workplace discrimination due to sex (*Title VII of the Civil Rights Act of 1964*, 1964). Before 1978, women could be fired from their job because they were pregnant until the Pregnancy Discrimination Act of 1978 was ratified by Congress (*Pregnancy Discrimination Act of 1978*, 1978). The pervasive discrimination of women transcended beyond the workforce into educational settings. In 1972, the United States signed Title IX, a landmark movement towards equality for girls and boys in elementary, secondary and post-secondary institutions who receive federal funding (*Title IX of the Education Amendments of 1972*, 1972). Title IX of the Education Amendments of 1972 states that it "prohibits the discrimination on the basis of sex in any federally funded education program or activity" (*Title IX of the Education Amendments of 1972*, 1972). Another landmark movement began in the 1980s known as Affirmative Action; affirmative action is working towards improving opportunities in educational and occupational settings for women and minorities who have been historically discriminated against in the United

States (“Affirmative action”, 2018). These anti-discrimination laws challenged the foundation of how women and girls are treated in the work place and in educational settings.

With barriers and discriminatory practices lifted it contributed to the unprecedented growth of women obtaining bachelor’s degrees and entering the job market. In fact, if the growth of women to men in the United States obtaining bachelor’s degrees continues at the rate it does, by the year 2028 there will be over 1.1 million women and 816,000 men with at least a bachelor’s degree (“Number of bachelor’s”, 2019). Additionally, women now comprise of half of the labor market in the United States in comparison to just over 30% in 1950 (Status of Women in the States, 2015). Due to the growth of women attending post-secondary institutions across the past decades, the increase of all women participating in the labor market and the increased demand for STEM occupations, the course selection of STEM courses has narrowed between men and women; yet, career choices and aspirations have not shifted for either group (Kimmel, Miller & Eccles, 2012). Despite the sheer number of women pursuing advanced education, the number of available occupations in the STEM field and the growth of women in the labor force should demonstrate an overall growth of women in STEM careers, yet the phenomenon of underrepresentation of women in STEM continues to reveal itself in statistics.

Although the growth of women earning post-secondary degrees is only increasing and surpassing male counterparts, women still face the difficulties of the detrimental practices that discriminated against women in and out of the workplace. Along with overt discrimination that still exists in the workplace, women also experience a subtle form of sex discrimination known as the “glass ceiling effect.” The glass ceiling effect is defined as “an invisible barrier that prevents women and minorities from rising to the highest ranks in their occupation” (“The glass ceiling”, 2017). Additionally, today’s adolescent girls, born long after Title IX, still experience

discrimination in academics. In a recent study of middle/high school aged girls in the United States, over fifty percent reported that they experienced academic sexism (McKellar, Marchland, Diemer, Malanchluk & Eccles, 2018). In fact, many teachers still perceive mathematics as "harder" for girls even if they perform the same as a male counterpart (McKellar et al., 2018). This corresponds with reports from females who report academic sexism state that they are more likely to experience differential treatment in mathematic and science courses. Research further demonstrates that if females experience, or even perceive, gender differential treatment in a given subject, it decreases their motivation in the given subject (McKellar et al., 2018). Studies demonstrated that female students are more sensitive to teacher feedback, internalizing messages teachers send in the classroom as diagnostic of their own capabilities (Pomerantz, Altermatt & Saxon, 2002). Therefore, if adolescent females perceive or experience differential treatment, they are less likely to stay motivated in mathematics and science, the subjects they are most likely to report differential treatment; this lack of motivation may lead to poor grades in the subject content, drop out of advanced STEM courses, perception that they cannot do STEM courses and their teachers see poor grades and confirm their own beliefs about females in STEM.

Gendered roles and expectations

The advancement women have made in their rights', in the workplace and in education settings are a feat in their own regard. Yet, in contemporary United States gendered roles and gendered expectations are sculpted at a young age and reinforced throughout a lifetime. From an early age, children gather networks of knowledge about gender roles and expectations in order to understand the social context around them (Steinke, 2017). These schemas about what a certain roles and expectations are expected to be completed by who, therefore, influencing perceptions, beliefs and behaviors (Steinke, 2017). Cultural influence of contemporary United States tended

to build a large gender difference between men and women built upon biology as the reason for these differences (Gilbert & Rader, 2001). Meta-analysis of studies focusing on gender indicate that men and women are more alike than they are different (Gilbert & Rader, 2001). Yet, popular influence indicates innate differences that transcend into career choices in men and women. For instance, girls and women believe that they should make occupational sacrifices for family purposes, and they should pursue career paths that help others (Eccles, 2007). Boys and men tend to value making a sustainable income and having a successful career (Rozek, Hyde, Svoboda, Hulleman, & Harackiewicz, 2015). These beliefs regarding roles and expectations developed by traditional gender roles influence career decisions throughout adolescence and into adulthood. Women and girls internalize expectation that they need to sacrifice for the family. Many believe that STEM careers take too much time away from home and family life, therefore dissuading women and girls from STEM careers.

Media perceptions of any group of individuals has a substantial influence on either dispelling or perpetuating stereotypes of said group. (Steinke, 2017). The media bolsters social identities of any given group; individuals affiliate or disassociate with to form an individual's social identity (Steinke, 2017). Generally, mass media depicts individuals working within the STEM field, or pursuing a STEM career, as someone who is "abnormal" in some regard (Steinke, 2017). Regardless of sex, these individuals tend to show difficulty communicating with laypeople, lack human characteristics such as empathy, show arrogance towards others or other "abnormal" characteristics (Steinke, 2017). Additionally, they often make major, dramatic sacrifices regarding love and family (Steinke, 2017). Women in STEM often displaying these characteristics but are also typically cast as less prestigious than their male counterparts (Steinke, 2017). In fact, many young people surveyed in the United States generally have an unpleasant,

negative perception of STEM careers (Lufkin, 2009). Additionally, the ratio of females to males in STEM positions in cinematography is 1 female to 8 males (Steinke, 2017). The media does not shine a neutral light on STEM careers. By showing those individuals as "abnormal", lacking love and/or family and the clear lack of representation of diverse characters it is easy to dissuade adolescent girls from wanting to become an engineer or a chemist.

The history of women in work and education along with the cultural expectations of gender from groups and the media demonstrate only a small fraction of the discrimination women have faced solely in education and occupations in general. These factors contribute to career choice and career selection for individuals, regardless if the career is STEM related, so in order to further understand the phenomenon, one also must understand what influences individuals to pursue one career over another.

Influences of career choice

The vast complexity of career choice is interwoven by many different influences in an adolescent's life. Career choice is not only governed by what the adolescent may like to do, but also the adolescent often considers job outlook, necessary schooling and the motivation to complete said schooling, personal identity, parental/peer/educator influence, society's perception of the particular career and how that career may influence or hinder their future life goals that may include traveling, making money, having a life partner and/or having children and a family. Furthermore, careers themselves have their own unique personae that is constructed by historical context, perceived identity of said career and is governed by the political and economic sphere. Understanding the influence of these facets is key to understanding not only the complexity of career choice in adolescent females, but also understand the lack of STEM careers held by women.

The perception of others in the individual's life has a profound, qualitative influence on career choice in adolescents. Social agents such as parental figures, teachers, school counselors, friends, peers, family and various others influence a choice directly or indirectly (Rice, Barth, Guadagno, Smith, McCallum & ASERT, 2013). For instance, if an adolescent is interested in majoring a very particular field with a perceived limited job market and value, a friend, peer or family member may dissuade them from majoring in that field due to its lack of jobs. This may lead the adolescent to major in a major that has a perceived job market value over a major they were interested in earning a bachelor's degree. Social agents demonstrate a compelling influence on what adolescents think they are "good" at and what they are told they are "good" at or are told what to do.

Personal characteristics greatly influence career and occupational choices. In fact, studies in adolescent career choice suggest that: intellectual competencies, expectations for success, rational decision making, motivation, self-concepts of own ability and personal identity of are the large contributors to career choice (Eccles & Wang, 2016). Students' self-perceptions the strongly linked to academic pursuits and occupation selection (Rice et al., 2013). Students consider their intellectual competencies and expectations for success in any given subject to determine if they are "good" at that subject; if the individual experiences success in that subject content, they are far more likely to pursue a career in that subject (Eccles, 2014). If a student feels as though they excel in their foreign language class, they are more likely to pursue a career that allows them to utilize their perceived ability in the subject. Further, a student's personal identity drives career choice. An individual's rational judgement is then utilized to determined what the student thinks they are best at as the basis for future education and occupation choices (Stoet & Geary, 2018). Personal characteristics and a student's self-perception assist in

determining occupation selection since students who are highly motivated or students that feel as though they are better at one subject over another are more likely to pursue the subject, they feel they are excel.

Individuals also consider how a given career is in relation to their personal identity and their social identity (Eccles, 2014). Many career counseling theorists including Frank Parsons and John Holland demonstrate that matching an individual's traits with the requirements of specific occupation are important to career selection (Zunker, 2016). If a given career does not correlate with their personal and social identity, they are unlikely to pursue the given career, even if they do well in the given career. Another important consideration is the student's culturally-based schemas linked to gender, socioeconomic status, racial and ethnic group (Eccles, 2014). Students who do not have representation of someone from their own social group, are less likely to pursue careers in that area. One's own identity influences career choice since in the United States, career is highly linked to one's own identity in adulthood.

In addition to personal characteristics, self-perception and personal identity in relation to the given career, the importance of motivation cannot be measured and quantified to its importance in career choice and attainment in a given field. Motivation links to goal setting to achieve the education necessary for a given career (Eccles, 2014). Motivation in educational and occupational selection is investigated utilizing the expectancy-values model of motivation (Leaper, Farkas & Spears Brown, 2012). Adolescents are motivated to excel in subjects by what they are expected to succeed and those subjects that they find value in which reflects those educational and occupational choices for the future (Leaper et al., 2012). In fact, students' achievement is generally lower in subjects which they do not see themselves as competent in or ones that they find uninteresting (Leaper et al., 2012). Therefore, they do not pursue careers they

feel they are not competent in or that they value. These values are interest, attainment and utility value of a career. Interest value is liking the subject (Eccles, 2014). Attainment value is the link between the career and an individual's personal identity (Eccles & Wang, 2016). If a student links a career with their personal identity, they are more motivated to succeed in classes that pertain to the career. Lastly, utility value is finding the value of said task for helping fulfill personal goals (Eccles, 2014). These goals a student creates for themselves further influence career choice. For instance, if a student's goal was to become a wildlife photographer, they are more likely to find the utility value, and motivated to do well in, classes including photography, arts and even wildlife studies classes over an English or human geography class. In order to encourage more girls to pursue STEM careers, one needs to connect girls to STEM through their identity, through their motivation and how they perceive the different values of STEM classes and STEM careers.

Adolescent girls and STEM careers

There are women entering STEM careers. Statistics indicate that women enter the STEM domain from 7% in 1970 to 28% in the United States ("Has employment", n.d.). Women who do enter STEM careers are more likely to chose STEM careers that are more likely to interact with others (Eccles & Wang, 2016). These careers include: health, biology, medical science and psychology (HBMS) (Eccles & Wang, 2016). This is representative of society's construction of what masculinity and femininity roles in careers and expectations of both gender constructions. Masculine careers include trades, science and math (Liben, Bigler & Hilliard, 2014). Whereas feminine careers include helping fields and working with people (Liben et al., 2014). The underrepresentation of women is most apparent in STEM fields such as: mathematics, physical science, engineering and computer science (MPECS) (Stoet & Geary, 2018; Eccles & Wang,

2016). Traditionally, MPECS domains are masculine careers: working less with helping others and more with objects and with quantitative focus (Eccles & Wang, 2016). While HBMS STEM related occupational fields are viewed as more likely to help others, and they are also described as more likely to be more "family friendly" than other STEM occupations (Eccles & Wang, 2016). HBMS fields also are viewed as less-intensive in "hard sciences" such as chemistry and physics and less intensive in mathematics than other STEM fields (Eccles & Wang, 2016). Moreover, women surveyed are more likely to believe that it is their responsibility to make occupational sacrifices for the family (Eccles & Wang, 2016). Gendered roles and expectations of women historically and in contemporary society may have instilled that work-family balance as the woman's duty; women who work either full-time or part-time still fulfill household duties and childcare responsibilities more than men in heterosexual relationships (Eccles & Wang, 2016). Since HBMS fields are generally viewed as more accommodating to the family needs, women may be more likely to pursue those fields so that they can maintain that balance. However, extensive reviews of HBMS and other STEM occupations revealed that both are equally math, science and takes equal time away from the family (Eccles & Wang, 2016). Although women are entering both HBMS and MPECS fields, the lack of women in MPECS due to social factors and psychological factors.

Social factors

Further social influences that play a vital role in STEM-career decision making is the role that peers, parents and teachers play in an adolescent's life. During adolescence, peers greatly influence each other, and their opinions are crucial to an adolescent. For instance, peers and friends influence achievement, motivation in activities, personality and risk-taking behaviors (Sieglman & Rider, 2015). Peers serve both as an academic comparison group to one's own

abilities and serve a role as an encourager or serve a role as someone to dissuade someone from any subject (Rice et al., 2013). Adolescent girls may compare themselves to others on tests in STEM subjects and determine that they are just not as good as someone else in the course which may dissuade them from pursuing STEM further, even if they are better in the subjects. Generally, adolescent girls have lower expectations for success in STEM domains, so that is projected by themselves, peers, teachers and parents (Rozek et al., 2015). When students do not perceive support in certain subjects, they are less likely to pursue more classes or occupations with that subject content.

In addition to peers, many parents may intentionally or unintentionally endorse these gender-stereotyped beliefs regarding the general gendered differences, gender roles and gender expectations (Eccles, 2014). Many parents tend to exaggerate these differences in abilities, interests, skills and activities between their sons and their daughters (Eccles, 2014). Often, parents provide their child(ren) with gender stereotyped toys that enforce gendered roles and expectations for both men and women (Eccles, 2014). Research conducted by Eccles (2014) demonstrates the gender differences in how parents perceive their son's and daughter's mathematics abilities. Both adolescents took a mathematics exam and the results were shown to the parents of the adolescents (Eccles, 2014). Results showed that parents were more likely to underestimate their daughter's mathematics ability, and more likely to say that their son was "better" at mathematics than their daughter (Eccles, 2014). Further, Eccles (2014) also found that parents in the study made differential causal attributions to their son's and their daughter's mathematics ability. These parents often equated their son's score to "natural ability" and their daughter's score to "hard work" (Eccles, 2014). This analysis demonstrates that parents are perpetuating gender stereotypes that indicate that girls are not as "good" at STEM courses than

boys which can transcend into the girl's perception of her own academic ability. Parent expectations for their adolescent's success and what they value for them is linked to the adolescent's values and their own belief in their success in a variety of subject content (Rozek et al., 2015). This further influences the adolescent's educational choices and success outcomes (Rozek et al., 2015). For example, the daughter may be bright in STEM courses, but she may hear that she does not have the "natural ability," so she may be dissuaded from going further in STEM. Prior research in career choice demonstrates that career choice is largely influenced by one's own perception in their ability to do well in a given occupation. Therefore, if one does not feel they can do well in an occupation, they are unlikely to pursue that occupation.

Numerous studies find that although girls and boys perform similarly on STEM assessments, girls will generally report that they are "not good" at STEM; in fact, this notion is so pervasive that even the girls who performed significantly better than a boy will have poorer self-concepts in the subject than the boy who scored worse than the individual (Marsh & Yeung, 2016). So, it is necessary to build the confidence of adolescent girls in STEM courses through dispelling stereotypes regarding women in STEM, how women perform in STEM subjects and the occupations in STEM. Stereotypes regarding women and mathematics proven to be an influencing factor on mathematics competency exams. In the United States, women are perceived as "not good at math" (Spencer, Steele & Quinn, 1999). When a belief is held regarding a stigmatized or marginalized group's ability in specific domains, it creates heighted arousal and fear that their individual performance will confirm the negative stereotype which lowers test performance (Nadler & Komarraju, 2016). Research conducted by Spencer et al. (1999) demonstrate those stereotype threat effects. They recruited students who scored in the 85 percentiles for mathematics on the American College Testing (ACT) and the Scholastic Aptitude

Test (SAT) and those who took calculus and earned a grade of "B" or better (Spencer et al., 1999). In the first condition, researchers told participants that the mathematics exam produced a significant sex difference whereas males performed better than females and condition two the participants were told there was no sex differences between males and females who took this mathematics exam (Spencer et al., 1999). Results demonstrated that in condition one, males significantly outperformed females (Spencer et al., 1999). In the second condition there was no significant difference between males and females on the same mathematics exam (Spencer et al., 1999). This demonstrates that gender stereotypes influence overall performance on some competency exams and further hinder women and girls from continuing in STEM courses because of this underperformance, or perception that they are not good at those subjects which only dissuade adolescents from the subject(s).

Comparisons of STEM related course work in middle and high schools across the United States indicate that girls do just as well on math and science, yet boys are more likely to believe they are more competent in the subject matter, thus more likely to pursue STEM occupations (Leaper et al., 2012). This indicates that there is no biological difference between girls and boys in their ability to do well in the content, just variation between individuals suggesting that females likely to be such as successful in STEM as males who scored similar (Stoet & Geary, 2018). Yet, a survey of 457,000 adolescents from 67 different countries found that boys are more likely to report higher values on STEM occupations and report STEM as an academic strength than girls who scored the same on STEM assessments (Stoet & Geary, 2018). This demonstrates that there is a difference, societal forces that make girls rank their competency in the material much lower than boys indicating a main factor that contributes to the lack of adolescent girls pursuing STEM majors and STEM careers.

Addition to the fact that individuals are less likely to pursue a career they do not feel competent in, girls do place a high value on STEM fields, but they also place high values on other domains such as English, arts and social sciences than boys (Rozek et al., 2015). The high value many adolescent girls place on STEM fields and their performance on STEM assessments demonstrate that girls generally see value in STEM occupations meaning that they are likely to potentially pursue a career they find valuable (Stoet & Geary, 2018). However, they place value across other domains and are more likely to pursue a domain that historically links women to be "better at" such as English (Rozek et al., 2015). Meaning that interventions regarding dispelling stereotypes and encouraging the relevance and value of STEM careers.

Psychological factors

Individual psychological factors contribute to why adolescent girls do not pursue STEM majors and STEM occupations. These factors include the expectancy-value model, perceived ability in STEM courses and gender identity. The expectancy-value model of motivation provides context behind the investigation into the lack of girls pursuing STEM-related courses, majors and/or careers (Leaper et al., 2012). How an individual's perceived ability and interest level in a given subject determine how successful they will be in the given subject and the motivation to continue to excel in those subjects (Leaper et al., 2012). The expectancy-value model of motivation describes that individuals are motivated to excel in subjects they are expected to excel in and subjects they internalized values to (add more can't end on a preposition (Leaper et al., 2012). Many academic studies demonstrate that students' achievement is generally higher in subjects that they are expected to excel in, find competency in and/or find interesting (Leaper et al., 2012). The expectation for success in a given subject reflect the individual's belief in their own ability in the domain (Leaper et al., 2012). Therefore, the perceived interest and

ability levels of the individual plays a significant role in the classes they take and the professions they select.

Expressed throughout the literature review, girls and women are capable of being highly successful in STEM. Yet, when comparing adolescent boys and girls of the same math competence, boys express more confidence in their math abilities than girls (Eccles & Wang, 2016). This demonstrates that although girls and boys who score the same scores in math and science assessments, boys are more likely to score higher than girls in ability and value regarding the subject (Leaper et al., 2012). In fact, studies demonstrate that boys have strong self-concepts in their math abilities than girls in the same abilities (Marsh & Yeung, 1997). Additionally, even girls who perform better than boys on the same STEM course still have poorer self-concepts related to their abilities in that STEM course than boys who scored lower than them in the course (Marsh & Yeung, 1997). Girls perceive a B-grade as inadequate grades and drop STEM electives while boys who earned a C-grade in STEM classes are more likely to persist in STEM classes (Lufkin, 2009). The poor perception of their academic success in STEM leads adolescent girls to believe that they are not "good" at STEM, therefore, less likely to further pursue STEM careers because they do not see themselves as successful in the classes. Even when their performance is similar or better than boys.

Lastly, gender identity, that includes other facets of gender such as expectations, gendered roles and traditional gender stereotypes play a role in an adolescent girl's decision to pursue STEM courses, majors and/or careers (Stake, 2006). Research suggests that girls experience more pressure than boys to conform to gender roles and expectations (Gilbert & Rader, 2001). Because gender roles and expectations for women depict them not as competent as men in STEM-related subjects. Also, they are expected to sacrifice their career for the family,

girls may shy way from the STEM field since the stereotype of STEM is that it is challenging, takes time out of one's personal/family life and many believe that boys tend to score better on math and science, thus making them more suitable for STEM careers. Furthermore, adolescent girls who are talented in STEM courses are caught between their own internalized gender identity, their own belief in gender stereotypes and their accomplishments in STEM courses; in fact, a study demonstrated that many of these girls who are talented in STEM were likely to shy away from more challenging STEM courses because of their beliefs in cultural stereotypes (Rozek et al., 2015). Gender identity plays a significant role in STEM career selection, so encouraging today's adolescent girls the ways girls can identity their gender with STEM would be necessary to encourage more women to enter the STEM workforce.

Through understanding the numerous factors of influence the reasons behind the pursuit of or dissuasion of STEM careers in girls and women, one can approach the interventions necessary that tackle those challenges through individual and systematic changes. These changes examine targeting individual thoughts behind STEM, their value in STEM, the support systems' perception of STEM careers and systematic changes in the curriculum and school structure that looks at promoting STEM careers in their students.

Promoting STEM careers in adolescent girls

The clear underrepresentation of women in STEM careers is one that needs to be addressed in a multi-level approach through systematic and individual networks. The lack of women accounts for discriminatory work place practices, academic sexism, gender stereotypes, social influences, STEM stereotypes and even the influence of the media. In order to address the growing issue, schools and parents need to work towards techniques and interventions that encourage, not hinder, tomorrow's women today. School counselors serve as a primary role in the school to help transform the school climate surrounding STEM courses and careers, and they serve to assist all students academically, personal/social and career domains. Written into the American School Counseling Association's National Standards for Students demonstrate that school counselors should explain how work can help to achieve personal success and satisfaction (ASCA, 2004, C1.2). They should also motivate students to take pride in their work and achievements in and outside of school (ASCA, 2004, A1.3). Further, school counselors need to understand the importance of equity and access to career choices (ASCA, 2004, C1.6). Written into ASCA's Ethical Standards for School Counselors, it describes that school counselors must "Identify gaps in college and career access and the implications of such data for addressing both intentional and unintentional biases related to college and career counseling" (ASCA, 2016, A.4.c). These ordinances written by ASCA demonstrate that the school counselor stands to assist their students with career domains, academically and personal/social. So, the role of promoting STEM careers in all students, especially adolescent girls, demonstrates all three domains school counselors address in their students.

School counselors should aim interventions that promote STEM interest and STEM competency in youths in all age-levels; however, intensive targeting and promotion campaigns

need to reach middle school students. Numerous empirical studies suggest that many of girls begin to lose interest in STEM classes around the age of twelve-years-old. Interestingly, this also is the traditionally when puberty and other adolescent developmental characteristics start. Beginning at the age of twelve adolescents begin to desire a sense of identity through the integration of prior experiences, self-evaluation and feedback from the social environment (Leighton, 2008). Self-identity, beliefs, values and meaning making take center stage during adolescence as they work to develop who they are, their place in the world and who they wish to become as adults (Leighton, 2008). Adolescents further gain identity by not only actual perceptions, feedback and support from friends, parents, peers and teachers, they also forge a sense of identity through perceptions of different social circles they wish to belong in or a member. For instance, if an adolescent idolized a certain sport they play, they may dress more like how the society perceives athletes in that sport, they may follow fitness and athletes on social media and purchase products that any athlete may endorse. As described before, individuals in STEM are generally perceived as geeks, lack empathy or depict women as lesser than, it is difficult to gain the adolescent attention. Because adolescent girls lose interest in STEM courses as early as twelve-years-old, they begin to develop an identity that may describe themselves as "bad" at STEM classes or a persona that describes them as an individual not interested in STEM occupations. Furthermore, this identity development, what they commit to being as a trajectory into a future career path and/or post-secondary education (Cherry, 2018). Essentially, if adolescent girls do not see themselves in the STEM occupation as middle or high school aged students, they are likely to pursue a field they see themselves in in their post-secondary career.

To accurately approach this global issue, there are factors that need to be addressed. First, changing the view of STEM in adolescents' largest social spheres: parents, teachers, peers and media output. Further is challenging and reconstructing the STEM curriculum in public and private schools. Lastly, providing small-group sessions promoting academic self-perceptions, self-efficacy and/or the utility of STEM classes and STEM careers in middle school girls who do well in STEM classes, but their self-perception of their success in STEM is low. Through targeting all students, especially those who do well but do not perceive themselves as successful in STEM classes, one can expect an increase in interest in STEM, grade point average in STEM to increase, course enrollment increases and more students entering STEM courses. This increase should continue into occupation selection and post-secondary major choices as well.

These next sections provide research-based practices that promote STEM careers in youth. These sections include and describe: STEM-focused schools, institutional changes in schools and society, positive social support practices, promotion of academic self-perceptions and increasing the utility value of STEM classes and careers.

STEM-focused schools

Perhaps, STEM-focused schools were the earliest form of intervention aimed to increase interest in STEM subjects in the United States. STEM schools are like most public schools; however, they tend to offer more STEM courses beyond mathematics and science (Yednak, 2015). For instance, many STEM schools offer a second year of physics and second year of engineering (Yednak, 2015). STEM schools are not only STEM focused curriculum, but they are centered on the concept of educating students of the four specific domains as integrated subjects into everyday life versus teaching the four domains as four separate disciplines (Hom, 2014). STEM courses are integrated into a cohesive learning paradigm (Hom, 2014). The idea is that by

developing STEM concepts such as the scientific method in all facets of everyday life, it will quip the interest of young minds into the importance of STEM knowledge (Hom, 2014). In elementary schools, students are introduced into STEM courses, awareness of STEM fields and occupations aimed to pique the interest of students (Hom, 2014). At the middle school level, the courses become more rigorous and challenging, but are still demonstrating the importance of STEM in all domains (Hom, 2014). In high schools, courses and career pathways allow students to select an occupation pathway they may want to pursue after graduation (Hom, 2014). STEM-focused schools, such as Math and Science Academy in Woodbury, Minnesota, booster high passing rates on statewide national standards. In 2018, 80.8% of Math and Science Academy students either "meet" or "exceed" statewide Minnesota Comprehensive Assessment standards in mathematics (Minnesota Department of Education, 2018). Whereas 65.5% of Woodbury Senior High School students "meet" or "exceed" those same statewide standards (Minnesota Department of Education, 2018). Even further, 56.2% of all students in Minnesota either "meet" or "exceed" standards (Minnesota Department of Education, 2018). These scores demonstrate that students who attend STEM-focused schools score significantly better than the public-school counterparts. Although, students who attend STEM-focused charter schools may have other factors that contribute to their success such as: parental involvement, tutoring services, access to more resources and may be gifted in some subjects.

Institutional changes

To challenge the myths and stereotypes regarding STEM classes and STEM careers, one must also act to make institutional changes in the school environment and/or nationally to make changes in STEM curriculums. As a school counselor, one is in a vital position to make those changes in the school environment. Through building effective, research-based career readiness

programs for students across all grade levels not only builds career readiness in students, but it also exposes them to a wider range of occupations and post-secondary options. One may establish career fairs featuring diverse range of occupations representing all students. Furthermore, school counselors can collaborate with STEM teachers to incorporate science fairs and mathematics competitions. These fairs and competitions have the potential to identify, support and motivate talents students to further engage in STEM activities (Blankenburg, Hoffler, Peters & Parchmann, 2016). A study conducted to demonstrate how science fairs and other competitions sparked interest in STEM; researchers integrated a science competition into one middle school in the United States (Blankenburg et al., 2016). What they found was that sixth graders who participated in science competition were significantly more likely to continue to partake in science competitions (Blankenburg et al., 2016). This demonstrates that science competitions, fairs and other STEM-related school functions may be suitable to prevent a reduction of students' interest in science (Blankenburg et al., 2016). This study utilized self-determination theory in predicting why students were significantly more likely to continue to partake in these competitions. Self-determination theory suggests that "students become intrinsically motivated by letting students be autonomous regarding their learning and interacting with others" (SDT, Deci, 1975; Deci & Ryan 1985, 2000). While participating in these competitions, students elect their own project and contribute the research, the design and the presentation of their work, and they also interact with others for assistance and for collaboration. Through this independence and interaction with others, science fairs and other academic competitions assist students in discovering their potential and contributes to their self-confidence (Blankenburg et al., 2016). Through fairs and competitions, students internalize motivation to succeed, therefore piquing their interest in STEM and their persistence to continue in STEM

classes and STEM-careers. Other national organizations such as Operation SMART through The Connectory aim to promote STEM to girls across the United States. Operation SMART focuses on helping girls wonder, imagine and construct through fun, interactive STEM activities (The Connectory, n. d.). While the National Girls Collaborative Project uses "collaboration to expand and strengthen STEM-related opportunities for girls and women" (National Girls Collaborative Project, n. d.). Through strengthening girls' connections to other women in STEM occupations, girls can have mentors in the real STEM fields versus how STEM women are portrayed in the media (National Girls Collaborative Project, n. d.). Demonstrating to today's adolescents what an individual in STEM looks like and what they do dispels negative stereotypes and encourages today's girls to become tomorrow's female scientists for another generation of young women.

Media output regarding STEM occupations is changing. The key to this trend is children's cartoons depicting men and women in those shows as scientists, some even describe the importance of STEM through fun, interactive ways (Steinke, 2017). Many shows describe the women in the STEM occupations as competent, successful women with family and children, and the impact of the reinvented women in STEM in children's shows is that when asked to draw a scientist, girls are more likely to draw a girl as scientist (Steinke, 2017). This demonstrates that the younger generation of girls also see girls as scientists, thus depicting the perception of STEM careers and the individuals in them as different.

Positive social support

Numerous studies conducted across the United States suggests that adolescent girls are often discouraged from STEM classes either explicitly or implicitly by these groups: peers, parents and teachers. It must be expressed that positive social support increases academic performance in all subject areas (Bralie et al., 2012). So, not only is it crucial for adolescents to

receive positive social support for their overall desire to pursue STEM careers, but it also improves overall academic outcomes for adolescents (Rice et al., 2013). When a student feels more supported in academics, they are more likely to be not only interested in the subject but also feel more competent that they can succeed in the subject. One of the reasons adolescent girls do not pursue STEM career is simply because they do not feel competent in the course work; however, if they feel as though they are supported in sciences and mathematics, the number of adolescent girls in STEM will surely increase. In fact, studies indicate that if an adolescent girl perceives academic support from others in STEM courses, they are more likely to achieve higher grades and more likely to continue to take STEM courses (Leaper et al., 2012). Essentially, if peers encourage and show enthusiasm for STEM courses, they increase others' positive attitudes towards STEM courses, therefore increasing the interest value and course continuation (Stake, 2006).

Parents and teachers influence adolescents in a similar way. The more positive support in mathematics and science, the better the student's performance in STEM classes (Rice et al., 2013). However, facilitating parent involvement in their adolescent's academics may be difficult in some cases depending on several factors regarding parenting style, parental involvement, parent perceptions of academia, their adolescent and STEM classes and occupations. As a school counselor, it is necessary to facilitate parental involvement in their adolescent's academics because studies indicate that parents do hold a significant impact on their adolescent's decision-making process in terms of class selection and career selection and motivational practices and beliefs (Schillingford, Oh & Finnell, 2018). Additionally, an analysis of the aggregated reasons why individuals chose STEM demonstrates that two of the three reasons why they pursued a STEM career were: family interest in STEM and the quality of the conversations around STEM

(Schillingford et al., 2018). Whereas the other reason was their interest in STEM careers (Schillingford et al., 2018). This not only suggests the influence parents have on their adolescent, but it demonstrates the influence bares significance. School counselors can explain to parents that family interest in STEM subjects correlates to their adolescent's increased belief in achievement of STEM subjects (Schillingford et al., 2018). Even if the caregiver does not see interest in STEM, just expressing interest increases adolescent achievement in STEM which increases overall efficacy in school subjects and may increase overall academic performance. School counselors can also encourage parents to communicate to their adolescents about the relevance and utility of STEM classes in everyday life and the projected growth of the STEM job market when they are searching for occupations in the next few years. Parents who communicate the relevance and utility of STEM were shown to increase their students' competence and career pursuit of STEM occupations (Schillingford et al., 2018). Parental figures hold a key to influencing their adolescent(s) to pursue STEM careers, so it is necessary to inform parental figures of their influence they do hold over their adolescent's career choice.

Teachers hold a unique position as a social influencer because they also teach the STEM content. However, like students, many teachers view STEM classes as "challenging, difficult subject(s) and mastered by only a select few" (Crovrther & Bonnstetter, 1997). To increase teacher competence in STEM, needs-based technology integration training across all school levels for school teachers resulted in not only more positive attitudes in STEM from teachers, but those positive attitudes in STEM also increased in their students (Christensen, 1997; Christensen, 2002). Through simply integrating STEM into the classrooms, regardless of subjects, increased both teacher and student competence and positive attitude of STEM which challenged and altered the negative perception that STEM is difficult and only a select few do well in its content.

Teachers may also influence interest in STEM in the STEM classes. Studies found that teachers who relate the content of STEM classes to relevant parts of adolescents' lives found that it increased their motivation to do well in the STEM classes (McKellar et al., 2018). This finding is supported through earlier research conducted by Knezek, Christensen & Tyler-Wood (2011) and Middle Schooler Out to Save the World (MSOSW). MSOSW is a National Science Foundation (NSF) Innovative Technology Experiences for Students and Teachers (ITEST) (Knezek et al., 2011). MSOSW and ITEST went to 600 students in grades six, seven and eight in the United States with a goal to promote interest and relevant application of STEM careers (Knezek et al., 2011). The project was to have students and teachers learn how to measure standby power in their classroom and at home (Knezek et al., 2011). Standby power is the amount of power used with products being plugging in and using energy without being in use (Knezek et al., 2011). Upon completing the unit, post assessments conducted through MSOSW and ITEST determined that all students, especially females, had more positive STEM dispositions and were more interested in STEM careers than their pre-assessment scores indicated (Knezek et al., 2011). This demonstrates to students the importance, the relevance of STEM outside of equations, theories and laws written in textbooks. By captivating the interest of STEM, students may see the value of STEM occupations in the world and their real-world application of STEM. By demonstrating to students that STEM careers are not just the media depiction of beakers, graduated cylinders and laboratories. Therefore, more likely to continue in STEM classes and perhaps decide to seek a STEM career.

Further, teachers and other educators should be promoting Carol Dweck's well supported research on growth mindset versus fixed theory of intelligence. Growth mindset view of intelligence teaches scientific facts about the brain and how it is malleable, meaning that

individuals can increase their knowledge in any given subject (Yeager et al., 2016). When students and teachers believe that a low score on a subject means that that student is not "good" at the particular content, the student behaves in a way that is consistent with the belief (Yeager et al., 2016). Even the teacher teachers that student differently than the other students who are "better" in the content area (Yeager et al., 2016). Previously stated in the literature review, teachers are more likely to believe that girls are "not as good" at STEM than boys, so they are more likely to behave and teach the girls in STEM courses differently than the boys. However, by teaching both students and teachers about the science behind intelligence, it increased persistence by both teachers and students, therefore increasing grade point averages in subjects that students previously thought they were "bad" at (Yeager et al., 2016). School counselors can serve their schools with this information through teacher workshops and classroom lessons regrading evidence surrounding how intelligence is one that one can influence.

Academic self-perception

The poor academic self-perception many adolescent girls have towards STEM hinders many from pursuing STEM careers. To challenge academic self-perception girls, have towards STEM courses, school counselors can encourage to view intelligence as malleable rather than fixed (Merillat, Corrigan & Harper, 2018). Providing research that demonstrates the brain's capability to learn and its ability to gain knowledge may encourage all students that they can learn a wide array of subject content, regardless of their interest in the given subject. Through increasing one's ability to perceive their academic perception, girls may be more likely to see themselves as competent in STEM and more likely to pursue STEM in the future. Further, by expanding a student's self-efficacy, it creates a wider range of career options a student may want to consider (Bandura, Barabaraneli, Vittorio Caprara & Pastorelli, 2001). Expanding self-

efficacy is expanding one's "belief that they have the capability to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 2). Through increasing self-efficacy, students increase their effort, persistence in subjects and resilience when/if things go array (Simon, Aulls, Hubbard & Hall, 2015). Students with high self-efficacy report high intrinsic motivation and positive affect and achievement (Simon et al., 2015). Countless evidence-based studies demonstrate that those who have intrinsic motivation towards any given task are more likely to be successful in that given task. Therefore, school counselors who increase academic self-perceptions and self-efficacy of their students are more likely to see positive consequences in motivation, school performance and future successes in their post-secondary plans.

Utility-Value Interventions

Utility-value intervention campaigns demonstrate their effectiveness in retaining adolescent girls in STEM classes and encouraging them to pursue STEM careers in career selection. Utility-value interventions work to influence the factors of career selection outlined by Eccles (2014) and Eccles and Wang (2016). By transforming the way adolescent girls see STEM in their interest value, attainment value of STEM and utility value of STEM, adolescents are more likely to pursue STEM careers in their post-secondary and/or career plans. Further evidence supporting utility-value interventions demonstrate that the perceptions of utility value, how something will fulfill personal goals, predicted achievement in the subject in the classroom (Rozek et al., 2015). To demonstrate to adolescent girls the utility value of STEM one must look at the personal goals of the individual. Gender roles and expectations and general career trends demonstrate that many adolescent girls and women pursue careers in the "helping" fields such as teaching and nursing and working with people (Liben et al., 2014). Many adolescent girls do not

see STEM as career options that work with people and help others, thus they do not see STEM classes as a high utility value for them (Eccles & Wang, 2016). A study described by Eccles and Wang (2016) conducted research on 1,200 high school, college-bound adolescent girls in the United States who scored high in altruism, desire to help others. The study aimed to determine if STEM stereotypes could be dispelled and encourage adolescent girls into careers in STEM careers particularly MPECS (mathematics, physics, engineering and computer science) (Eccles & Wang, 2016). The intervention worked in small group-setting where adolescent girls focused on how STEM careers work could benefit wider society versus a smaller set of individuals (Eccles & Wang, 2016). What the research found was that the intervention increased interest in STEM, more adolescent girls enrolled in STEM elective courses as twelfth graders and performed better than they did as ninth graders (Eccles & Wang, 2016). Additionally, this increased interest in STEM also contributes to the expectancy-value of STEM classes since the increased interest in STEM influenced performance, effort and persistence in STEM (Wigfield & Eccles, 2000). When the performance, effort and persistence of individuals increased, it also positively influenced task-specific beliefs such as: ability, perceived difficulty of different task and individual goals, self-schema and affective memories (Wigfield & Eccles, 2000). Utility-value interventions therefore increase and positively influence individuals in not just STEM, but also their perceptions in other areas of academia and their persistence, self-schema and their goals.

School counselors stand as a crucial person in the schools to help the retention of adolescent girls to continue in STEM classes and perhaps elect a STEM-related career after graduation from secondary school. School counselors promote the academic, personal/social and career components of the whole student; this underrepresentation of women in STEM stands at

the intersection of all three of these domains. Interventions into the retention of females in STEM and selecting STEM-related careers as an occupation demonstrate that there are numerous factors interacting with each other simultaneously that are necessary to challenge and change to assist in the clear deficit of girls in STEM.

Discussion

The analysis of the sheer number of factors that influence women in the workplace such as contemporary and historical sexism, the factors that influence career choice, the reasons why adolescent girls and women do not pursue STEM courses and are trickling into STEM occupations. Other factors like the societal expectations of gender roles indoctrinated in the majority culture of the United States demonstrate that there needs to be interventions to encourage today's young adolescent girls to continue their STEM education. However, the interventions necessary to encourage these adolescents go beyond just telling girls that there are jobs in STEM industries. As clearly demonstrated through literature, career selection integrates a variety of identity, competence, interest and utility of careers; along with just the sheer complexity of career choice, other barriers such as stereotype threat, academic sexism, social influencers and poor academic self-perceptions in STEM further prevent many girls who do well in STEM classes discourage them from pursuing STEM careers. School counselors can integrate a career curriculum that shows a variety of careers, individuals in those careers and further encourage students to think about their future selves and what they see themselves doing when they are older. In this career curriculum, the individuals representing the careers should be diverse, counselors should be seeking diverse speakers in career presentations as well. Career curriculums should also instruct students how to set short and long-term goals for themselves, make the connection between the present self and the power the present self has over deciding

what the future looks like for the individual and how-to problem-solve. This teaches students that their actions can impact their future self, how to goal set and it exposes students to goal-setting, therefore, intrinsically motivating students to perform towards their goal(s). Additionally, school counselors need to educate parents/guardians, educators and students about growth mindset and the detrimental effects gender differential treatment can do to both girls and boys. This will assist those involved in the fullest potential of the students, therefore, making students more likely to feel confident in their academic abilities, themselves as individuals and a better understanding of the variety of careers in STEM available to all students.

Systematic interventions demonstrate that applying STEM to real issues in the world increases interest in STEM, other interventions demonstrate that the importance of utilizing social support networks to help encourage others to pursue STEM occupations. National organizations work towards networking adolescent girls to a collaborative network of STEM females to serve as mentors for these young adolescents. Further, through the integration of STEM-based issues into realistic issues in the world is key to Additionally, STEM-focused schools show significantly higher academic achievement in STEM classes in comparison to traditional schools. Yet, many of these interventions target utility-value interventions which are aimed to increase interest and relevance of STEM in students which has been shown to increase their retention in STEM classes and, therefore, increase likelihood of individuals pursuing STEM occupations. Besides increasing interest in STEM, interventions also need to address adolescent girls' academic self-perceptions in those courses. Increasing interest is necessary, but if an adolescent is interested in STEM, but believe that they are not as "good" as their peers, then they are less likely to continue STEM beyond the requirements in secondary school.

The development of a small-group of adolescent girls in middle school looking at improving academic self-perceptions through increasing self-efficacy would be effective in retaining girls in STEM courses. Self-efficacy is the belief that one has the capability to achieve a given task, therefore, by increasing self-efficacy individuals should feel more confident in their ability to succeed in STEM classes. If an individual feels successful in STEM classes, they find them more interesting and are more likely to pursue a STEM career upon graduation. Screening for girls' academic self-perception in mathematics is one way to determine group members that would benefit greatly from increasing their self-efficacy in academia. Utilizing Wigfield and Eccles (2000) Children's Ability Beliefs and Subjective Task Values Ability Beliefs Pre-Assessment (Appendix A) and comparing those scores with girls who currently are earning a "B" or better in mathematics. Those who are earning a "B" or better but also have lower scores on the pre-assessment would be candidates for the program because they are doing well in the content; however, they do not believe that they are "good" in the subject. That would indicate that they have low perceptions of themselves. Through electing evidence-based programs that promote self-efficacy, competence and other behaviors related to career exploration, this weekly small-group for six weeks should increase girls' self-efficacy related to their ability to set short-term and long-term academic, personal/social and career goals, ways to be resilient and problem-solving strategies. Each session explores a different topic in relation to setting and achieving short-term and long-term goals they set for themselves.

The first session of the group includes an overview of the group rules and an icebreaker activity where the group leader is able to gage where each participant of the group is at in terms of their self-perceptions, their goal-setting abilities and general disposition regarding school, their ability to problem-solve and ability to identify barriers.

The second session includes an art project where group participants describe their present selves in terms of: their likes, dislikes, goals, dreams, family, activities and any other describing characteristics they would like to share. Then, on the other half of the sheet of paper, they describe their future selves in ten to twenty years in terms of their goals, what they want to achieve, their family, their career goals, their education plans and places they want to see by that time. This activity allows for group members to begin to think about ways to plan goals and see their future selves.

In the third session, group participants learn how to set short and long-term goals utilizing S.M.A.R.T goal method created by Doran (1981). The participants learn about making goals specific, measurable, achievable, realistic and time-bound (Doran, 1981). This helps participants make the connection between their future selves and their present actions to achieve their future self as discussed in the second session.

The fourth session of this group is the focus on resiliency and is titled "*Ways to Stay Strong.*" In this session, participants discuss and write down different barriers they may face; then, they think of positive things about themselves that will help them overcome barriers. These positive factors include personality characteristics and support systems. In an art project, they craft together the positives about themselves and cover the barriers with those traits. This demonstrates that these traits and support systems can overcome barriers they may face in their lives. This further lets the group leader see what barriers the participants see in their lives and allows the leader to further assist the members with their goals.

In session five, group participants learn and discuss different ways to solve problems through an activity in which participants roll a dice with each dice number corresponding to a common way to solve a problem (see Appendix F). The group leader then reads a scenario (see

Appendix G) where participants state the problem then utilize the provided solution from the dice roll to work through the problem. If the solution does not work with the scenario, participants must pick a different solution that would work better and provide detail as to why it works better. In this session, participants not only learn different solutions to problems, they also learn that some solutions do not work with certain problems which teaches participants to try another solution until the problem is resolved. Many times, barriers prevent students from goals, so demonstrating to students the power of solutions, that nearly all problems are not going to be solved instantly, but with persistence and effort, they might be solved. Further, participants will receive a hand-out that details tips on how to problem solve (see Appendix H).

In the last session, group participants will evaluate their progress, what they have learned and where they want more help in learning or understanding. In the last session, group participants reflect on their experiences in group and how they grew in group. Participants also talk about their goals and how their goals changed. Group participants can provide feedback to the group leader on the content of the group and what they liked and disliked about the group. They are also able to inform the group leader of anything they still need help with or would like to learn more about. See Appendix B for the full content of this program.

Conclusion

Throughout the history of humankind, women and girls have worked towards shattering gender roles and expectations that hinder girls and women from doing what they want to achieve. Many inspirational women who crushed those barriers were written out of history or claimed as an achievement of a man. Even within the last two centuries in the United States, women had to shatter barriers so they can vote, not be discriminated against in the workplace and be able to play in athletics like the boys and men. Increasing STEM pursuits in girls and women is an on-

going struggle that has intersecting educational barriers, blatant sexist practices, workplace hinderances, gender expectations, social influences and self-perceptions. Many factors either bolster or hinder a girl's decision regarding occupation selection, so targeting any one of these factors is a decision that will involve many other intersecting institutional barriers. However, one cannot ignore the clear lack of women in STEM fields. Women are more than capable of competing and being successful in STEM fields. As humans continue to advance, more challenges need to be addressed through STEM fields. Perhaps it will be a woman from a small town in Kansas who will find a definitive treatment for all cancers. Maybe a young high schooler from the Bronx will develop a way to recycle plastic waste more efficiently. However, if barriers continue to hinder today's adolescent girls from pursuing STEM occupations, these advancements and countless other advancements may never be known.

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Appendix A: Children's Ability Beliefs and Subjective Task Values Ability Beliefs Pre-Assessment

Name: _____

Grade: _____

Developed by Wigfield, A., & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. Contemporary Educational Psychology, 25, 68-81. doi: 10.1006/ceps1999.1015

Directions: Please read each statement and circle the number on the scale below to how you feel about the statement. The answers are confidential, and the school counselor will be the only one who is able to see your answers.

1. *How good in math are you?*

Not good at all	Bad	Okay	Good	Very good
1	2	3	4	5

2. *If you were to list all the students in your class from the worst to the best in math, where would you put yourself?*

Worst in class	Bottom half	Average	Top half	Best in class
1	2	3	4	5

3. *Some kids are better in one subject than in another. For example, you might be better in math than in reading. Compared to most of your other school subjects, how good are you in math?*

Math is my worst subject	Math is one of my worst subjects	I am average at math	Math is one of my best subjects	Math is my best subject
1	2	3	4	5

4. *What grade to you expect to get in math this year?*

F	D	C	B	A
1	2	3	4	5

5. *How good would you be at learning something new in math?*

Not good at all	Not good	Okay	Good	Very good
1	2	3	4	5

6. *Some things that you learn in school help you do things better outside of class, that is, they are useful. For example, learning about plants might help you grow a garden. In general, how useful is what you learn in math?*

Not at all useful	Not useful	Neutral	Useful	Very useful
1	2	3	4	5

7. *For me, being good in math is:*

Not important at all	Not important	Kind of important	Important	Very important
1	2	3	4	5

8. *Compared to most of your other classes, how important is it **for you** to be good at math?*

Other subjects are way more important	Other subjects are important	All subjects have equal importance	Math is more important than other subjects	Math is the most important subject
1	2	3	4	5

9. *In general, I find working on math assignments*

Very boring	Boring	Okay	Fun	Very fun
1	2	3	4	5

10. *How much do you like doing math?*

Extremely dislike	Dislike	Okay	Like	Strongly like
1	2	3	4	5

Appendix B: Parent Permission Letter

Dear Parent(s)/Guardian(s): Month Year

As part of the counseling services offered at *school name*, we occasionally offer small group counseling for students. Starting in *month*, we would like to offer a support group called Girls Group. This group includes students from grades 6 through 8 who have experience insecurities in school in particular academics. The focus of the group is to help students construct their future goals, cope with barriers they may face and develop better problem-solving strategies. The group topics include sharing about their present and future selves, short-term and long-term goals, ways to confront barriers and problem-solving skills. Everything said in group is to remain confidential. Counselors will notify parents if any concerns arise during group sessions.

This group will be facilitated through the counselor(s) at blank school. The group will meet once a week for approximately 6 weeks and will meet during *given time*. If you think your child would benefit from this group, please indicate your permission for your her to participate in group by signing in the space below and ***return date and where to return the signed form.*** If you have any questions or concerns, please contact *name and contact information of counselor* for more information.

Sincerely,

Counselor(s) names

_____

Yes, I give my daughter _____ permission to participate in this Girls Group small group.

_____
(Parent Signature)

_____
(Date)

Appendix C: 6-week intervention program for middle school girls "Girls Group"

Session One: Introduction into Group

ASCA Mindsets and Behaviors

- M2: self-confidence in ability to succeed
- B-SMS 6: demonstrate ability to overcome barriers to learning

Objective

- Gain pre-assessment data regarding participants' STEM confidence, academic self-perceptions
- Participants will understand purpose of the group

Materials Needed:

- Group rules white board
- White board markers
- Fun size packages of M&Ms (enough for every participant)

Activity:

1. Opening
    a. Introduce the group
    b. Create a list of group rules that the group members agree to follow; be sure to include: kind words, one person talks at a time and the importance of only telling others what they said and/or what the school counselor said during group
    c. Start with an opening activity "rose, bud and thorn" from this week. Rose is something that went well that week (or weekend), bud is something an individual is looking forward to and thorn is something that did not go well from the week.
2. Activity
    a. M&M get-to-know-you game
        i. Pass out packages of M&Ms to each group participant
        ii. Have group participants each eat one color and answer the question to the corresponding color
            1. Red: What do you want to be when you grow up?
            2. Orange: Do you know how to set goals?
            3. Yellow: What do you like the most about *x* grade?
            4. Green: Who is your favorite teacher?
            5. Blue: What do you do if you have a problem?
            6. Brown: What thing(s) make it difficult to accomplish tasks?
3. Closing
    a. Close the group by reciting group rules
    b. Have participants create a new name for their group

Session Two: Who am I?

ASCA Mindsets and Behaviors:

- B-LS 7: identify long- and short-term academic, career and social/emotional goals

Objective:

- Participants will identify who they are and how they are connected to their future me
- Identify career goals

Materials Needs:

- Art Supplies

Activity:

1. Opening
    a. Remind group of group rules
    b. In a round, ask participants to fill-in blank of the following sentence
        i. "Today, I feel _____ about school."
2. Activity
    a. Give each participant a large sheet of poster board
    b. Instruct each participant to draw a line down the middle of the poster board
        i. On one side write: Who Am I at the top
        ii. On one side write: Who Do I Want to Be?
    c. Who Am I? side represents how the individual sees themselves in terms of what they like, what they do not like, character traits, their family, where they live and any other descriptor they see fit as describing who they are
    d. Who Do I Want to Be? Encourage participants to think of a goal they want to see themselves in 20 years. Encourage them to think about their dream job, their dream house, their dream family and where they want to live
3. Closing
    a. In dyads (or triads), participants pair up with a partner(s) and give them a chance to talk to each other about their present and future selves
    b. Ask participants what they notice between their present self and their future self; are there similarities?
    c. Explain that in the next session, they are going to learn how they can connect what they are doing now to their future self

Session Three: How Can I Get to the Future Me?

ASCA Mindsets and Behaviors

- M6: understanding that post-secondary education and life-long learning are necessary for long-term career success
- B-LS 7: identify long- and short-term academic, career and social/emotional goals

Objective(s):

- Participants will be able to identify components of SMART goals
- Participants will be able to identify short-term and long-term goals

Materials Needed:

- *What Makes a Goal S.M.A.R.T.?* (Appendix C)
- *Goals Worksheet* (Appendix D)

Activity:

1. Opening
    a. Ask participants what their future me looked like and if they can remember another participant's "future me" picture/ideas
    b. Ask participants if they know the difference between a short-term goal and a long-term goal
2. Activity
    a. Pass out *What Makes a Goal S.M.A.R.T.* worksheet to every participant and go over what a SMART goal is. If they already know ask what their goal was and how they made it SMART
    b. Ask participants to think of a short-term goal they have for themselves and a long-term goal they have for high school and after high school. Give a few minutes for participants to think of goals.
        i. Ask participants wish to share their goals with the group
    c. Go over *Goals Worksheet* with participants
    d. Participants will complete both short-term and long-term goals they have on the *Goals Worksheet*
3. Closing
    a. Ask participants why a SMART goal is helpful for them when thinking of their goals.
    b. If participants did not get a chance to complete their *Goals Worksheet* tell them they will complete it at home
    c. Tell members to bring their *Goals Worksheet* to the next session

Session Four: Ways to Stay Strong

ASCA Mindsets and Behaviors:

- M2: Self-confidence in ability to succeed
- B-SMS 7: Demonstrate effective coping skills when faced with a problem

Objective(s):

- Participants will be able to utilize positive coping strategies when faced with a problem
- Participants will understand ways to increase their self-confidence when faced with a problem

Materials Needed:

- Large construction paper circles
- Other "pizza toppings" construction paper
- Sharpies or other markers
- Scissors
- Glue

Activity:

1. Opening
    a. Open the group through encouraging group members to discuss with the person next to them how their week was going in terms of their goals
    b. Ask participants to share how their goals are going the past week with the entire group
2. Activity
    a. Pass-out large circles and markers to participants
        i. Explain to participants that goals can be hard to reach sometimes due to things called barriers
            1. Ask group if anyone can explain what a barrier means
        ii. With the participants tell them to brain storm and write these barriers that may block their way from achieving their future selves and their goals on their giant circle
        iii. Give participants some time to write down these barriers on the circle
            1. Inform the group members to share two barriers they wrote on their circle
    b. Afterwards, explain to group participants that ways we can cross barriers is through utilizing positive words about themselves and utilizing positive relationships they have with others
        i. Explain that now they are going to construct a "Positive Pizza" and they will build a pizza of their choice with "toppings." With each topping, they are going to write down one positive thing about themselves, their worth, what they are good at and/or other people or things that are there for them when they need. Then, they will glue the toppings over the barriers on their "pizza crust."
    c. Encourage group participants that when they are faced with barriers, they should take a slice of their "Positive Pizza" and repeat the words on their toppings, or seek the people and things they listed on their pizza to seek comfort and support
3. Closing
    a. Encourage group participants to share one of the positive things about themselves in a quick round.

Session Five: How do I get un-stuck?

ASCA Mindsets and Behaviors

- B-LS 1: demonstrate critical-thinking skills to make informed decisions
- B-SMS 7: demonstrate effective coping skills when faced with a problem

Objective(s):

- Participants will be able to think of multiple different solutions to solve problem(s)

Materials Needed:

- Beach Ball
- *Solution Dice* (Appendix F)
- Problem scenarios (Appendix G)
- *Top 10 Tips and Tricks to Solving Problems* (Appendix H)
- 1 dice

Activity:

1. Opening
    a. Ask participants about if they used their Positive Pizzas in the past week
    b. Have participants stand in a circle and give one participant a beach ball. Tell them that their goal is to keep the ball from touching the ground and one player cannot touch the ball twice in a row. However, they cannot talk to each other. After two-three minutes tell the participants that this round they can talk to each other. After two-three minutes tell the participants to have a seat
        i. Ask why the first round was so hard, what worked better in the second round, how did they problem solve and keep the ball in the air.
            1. If they struggled to keep the ball in the air, ask what they could have done to achieve the goal of the game
2. Activity
    a. Explain that even though we can keep trying, sometimes barriers will keep us from our goals. However, coming up with effective solutions or multiple solutions to try will help us overcome those barriers
    b. Show the participants the *Solution Dice* and explain to the group that these are common solutions to a problem they may face. Note that not every solution will work for the problem. Each solution on the spinner is numbered to correspond with a standard dice. Utilizing the Problem scenarios, have a member roll the dice, read the problem and encourage participants to try to fit the solution to the problem. If it does not fit, ask participants what they would use
        i. Use one or two of the problems on the problem scenario. Then, have participants give problems they see as examples
    c. After the activity, ask participants how the positive pizza fits with the solutions to problems. Inquire further about how these solutions to problems may help them achieve their goals.
    d. Ask them to think about one problem they might face with their long-term goal and encourage them to share what solution they would utilize
3. Closing
    a. Give each participant *Top 10 Tips and Tricks to Solving Problems* and go over it with them

Session Six: Where Am I Now?

ASCA Mindsets and Behaviors

- B-SMS 6: demonstrate ability to overcome barriers to learning
- M2: self-confidence in ability to succeed

Objective(s):

- Participants will reflect what they learned from group
- Participants will demonstrate ways in which they can continue to reach goals and be resilient

Materials Needed:

- Post Assessment (Appendix I)
- M&Ms

Activity:

1. Opening
    a. Ask participants if they utilized the solutions they learned if they were faced with a barrier
    b. Invite group participants to share how their goals are coming along, and if they had to adjust the goals
2. Activity
    a. Give each participant a M&M package and tell the participants to answer the following questions with each M&M
        i. Red: I am closer to who I want to be because I…
        ii. Orange: Goal setting is important because…
        iii. Yellow: I can overcome a barrier by…
        iv. Green: I am closer to my goals because…
        v. Blue: One thing I would change about this group is…
        vi. Brown: One activity I learned while in this group is…
    b. Have participants complete the Post-Assessment survey
    c. Dedicate the rest of the group time to conversations about goals and the importance of making new goals when old ones get achieved, always think positively and encourage participants to think of new solutions to problems
3. Closing
    a. Remind participants can always see the counseling staff or another trusted adult if they wish to talk more about their goals, their problems and helping them come up with solutions. They are also encouraged to seeking the counselor if they wish to talk about anything

Appendix D: What makes a goal SMART?

What makes a goal S.M.A.R.T.?

Goals are great! They are fantastic at motivating us to achieve things we want to achieve! Making a goal S.M.A.R.T. helps you keep track of your goal and help you achieve it!

Specific	A goal needs to be SPECIFIC meaning that the goal includes the who, what, when, where and why. When creating a goal, try to be as specific with the goal.
Measurable	What or how are you going to measure your goal? Are you going to measure it by your grades? Or, are you going to measure it by the hours you spend doing an activity? How are you going to know you are working towards your goal?
Achievable	Is the goal achievable meaning that you can reach your goal? Are you working on achieving the goal, or is your goal achieving something else? If so, change it to reflect that!
Relevant	Is the goal relevant to you! Is it something you want to do or something that makes you feel good about yourself and happy?
Time-bound	A S.M.A.R.T. goal is one that is time-bound meaning that there is a specific time in which you reach that goal! Short-term goals are usually in a few days or about a month at the most while a long-term goal is one that spans a couple months or even years!

Tips

1. Think positively!
2. Goals can ALWAYS be changed, so if the goal is not working out go back to the drawing board!
3. Tell supportive friends and adults about your goal; they will want what is best for you and will be there when you need them
4. Don't measure yourself to someone else! Everyone is different with different abilities and skills. Only compare with yourself!

Appendix E: Goals Worksheet

WHAT ARE MY GOALS?

Directions: Please answer the corresponding questions below. If you need help be sure to look at your *What Makes a Goal S.M.A.R.T.?* worksheet or ask!

MY SHORT-TERM GOAL IS:

_____

WHAT MAKES IT SMART?

S:

_____
_____
_____

M:

_____
_____
_____

A:

_____
_____
_____

R:

_____
_____
_____

T:

_____
_____
_____

WHAT ARE MY GOALS?

Directions: Please answer the corresponding questions below. If you need help be sure to look at your *What Makes a Goal S.M.A.R.T.?* worksheet or ask!

MY SHORT-TERM GOAL IS:

_____

WHAT MAKES IT SMART?

S:

_____
_____
_____

M:

_____
_____
_____

A:

_____
_____
_____

R:

_____
_____
_____

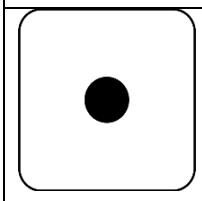
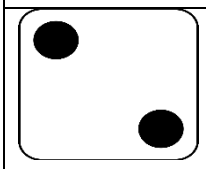
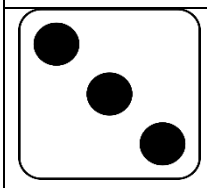
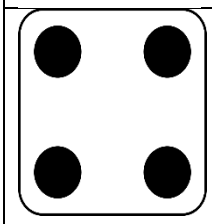
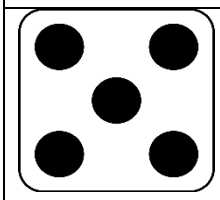
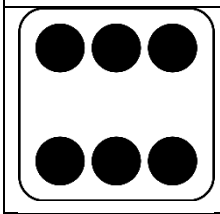
T:

_____
_____
_____

Appendix F: Solution Dice

Solution Dice

Directions: Player rolls one dice and another player reads the problem. Using the corresponding number, the player must try to use the solution to solve the problem. If the problem cannot be solved with the number rolled, the player must select what solution they would use and why

DICE NUMBER	SOLUTION TO TRY
	AVOID THE PROBLEM/WALK AWAY FROM THE PROBLEM
	GET HELP
	COMPROMISE/NEGOTIATE/USE I-MESSAGES
	STAYING CALM
	IGNORE THE PROBLEM
	KEEP PRACTICING/TRYING

Appendix G: Problem Scenarios

1: Your friends are gossiping a lot about other kids in your class, you know that gossiping is wrong because rumors are never true and can hurt others. You are trying to work on not gossiping so much, but it is really hard to do so when you are friends with people who like to gossip. What is the problem? What could be a solution?

2: A boy in your science class says that he is better at science than you. His comments are hurtful and make you not want to be in class anymore. What is the problem? What could be a solution?

3: You want to earn higher grades this grading period. Your parents/guardians said that if you earned higher grades they would pay you a certain amount for every B and A. Realizing this, you think that if you earn four "Bs" and two "As" you could buy a new phone case. You start working really hard during school, but your friends are laughing at you for trying hard in school and keep distracting you from getting your work done while you are at school. What is the problem? What could be a solution?

4: Someone in your band class tells you that you are the worst person to ever play that instrument ever. You try to get it out of your head, but you just cannot stop thinking about it. What is the problem? What could be a solution?

5: Some students in your class are excluding you from Google Hangouts and are also saying mean things about you on Snapchat. You told them to stop, but they did not listen to you. What would you do next? What is the problem? What could be a solution?

6: Your parent(s)/guardian(s) told you that you are not as smart as your older brother/sister. What is the problem? What could be a solution?

7: You cannot access the internet to complete homework assignments when you are at home because your family cannot afford WiFi. What is the problem? What could be a solution?

8: You have a hard time keeping track of assignments and you do not do well on quizzes and tests. What is the problem? What could be a solution?

Appendix H: Tips and Tricks

Top 10 Tips and Tricks to Solving Problems

1	Keep trying	Problems may look hard or even impossible, but if you stick with it and keep trying, a solution will come its way to help!
2	Stay positive	Solutions come to you when you are not spending your brain's energy beating yourself up! Say phrases like "I can do this" or "it does not have to be perfect."
3	Ask for help	Solutions come to you when you are not spending your brain's energy beating yourself up! Say phrases like "I can do this" or "it does not have to be perfect."
4	Come back later	Problems are hard to solve when you are frustrated! Take a break if you can and come back to it later allows your brain to clear-up and come up with solutions.
5	Keep practicing	Think about it, if you gave up if you did not do something perfect on the first try or if someone said no, you would not be walking on two feet. Take advice from a baby and try again!
6	Consequences	Think through all the possible solutions and their consequences. Pick solution(s) that are the best for you/others and align with your goals
7	Talk it out	Use I-messages, compromise, negotiations and open communication with the person who part of the problem
8	Stay calm	Staying calm means you will have a clear mind to come up with solutions
9	Avoid the situation	If you can, avoid situation(s) that cause those problems in the first place!
10	If something stinks, change it!	You have the power to change certain outcomes. Learn what you can and can't control and work on controlling what you can!

Appendix I: Post-Assessment

Name: _____

Date: _____

Directions: Please read each statement and circle the number on the scale below to how you feel about the statement. The answers are confidential, and the school counselor will be the only one who is able to see your answers.

1. *My confidence in my ability to make a goal has increased:*

Strongly Disagree	Disagree	It has not increased or decreased	Agree	Strongly Agree
1	2	3	4	5

2. *If I came across a problem, I can solve it:*

Strongly Disagree	Disagree	It has not increased or decreased	Agree	Strongly Agree
1	2	3	4	5

3. *I feel like I can overcome barriers that hinder me from my long-term goal:*

Strongly Disagree	Disagree	It has not increased or decreased	Agree	Strongly Agree
1	2	3	4	5

4. *I can relate the future me to the present me:*

Strongly Disagree	Disagree	It has not increased or decreased	Agree	Strongly Agree
1	2	3	4	5

5. *I feel more confident in my school subjects:*

Strongly Disagree	Disagree	It has not increased or decreased	Agree	Strongly Agree
1	2	3	4	5

6. *Please **circle** subject(s) below in which you do not feel confident in:*

Art	Physical Education
English/language arts	Reading
Health	Science
Mathematics	Social Studies
Music	Technology

Directions: Please read each statement and write two or more sentences answering the question. Your answers will remain confidential. Your questions will help improve the group for future group members!

7. *My favorite thing about the group was:*

8. *One thing I learned is:*

9. *If I could change one thing in the group, I would change:*

10. *I still need help with:*