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Gender Differences in Socio-Emotional and Socio-Cultural Perspectives of Middle School Students in STEM Learning

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The U.S. Department of Education, Office of Innovation and Improvement, (2016) has shared a response about science, technology, engineering, and mathematics (STEM) focused learning: "A strong STEM education—one that results in the skills and mindsets…opens the door for lifelong learning—starts as early as preschool, is culturally responsive, employs problem- and inquiry-based approaches, and engages students in hands-on activities that offer opportunities to interact with STEM professionals" (p. 1). The Department of Education also explained that STEM is an integral part of education that allows connectivity of STEM and interdisciplinary connections to reading, writing, art, physical education, and more. According to Drew (2015), STEM education is crucial to ensure that students are competitive in the future STEM fields.

A variety of educational reforms have come into focus in the past two decades in the U.S. In the 1990s, the Goals 2000 Education America Act was passed, tasking schools with the idea to improve competition in world markets (Spring, 2014). The No Child Left Behind Act of 2002 was established to attempt a uniform standard and test system within the U.S. (Spring, 2014). The National Academy of Sciences, National Academy of Engineering, and Institute of Medicine (2007) met to discuss the needs and functions of STEM in the U.S. The committees reported that "Other nations have learned from our history, however, and they are boosting their investments in science and engineering education because doing so pays immense economic and social dividends" (p. 94). The report also suggested that K-12 schools in the U.S. faced challenges in student preparation, interest, attrition, and inadequate preparation in the STEM fields. In 2010, the committee responded with an analogy of torrential hurricanes, noting the idea that the "*Gathering Storm* increasingly appears to be a Category 5" (National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, 2010, p. 5). Also, Kramer (2016) reported the U.S. STEM programs' results and shared that the U.S. had placed 36th in mathematics and 28th in science among the 65 nations that had assessed its students.

More recently, the National Science Board (2018) reported that "Raising overall student achievement, reducing performance gaps among different groups, increasing advanced course-taking, recruiting more STEM teachers, and improving college readiness in mathematics and science" were the focused priorities in education for the U.S. (p. 105). While investments in education have taken place, increasingly concerning for educators is that students are not competitively ready or interested in continuing in the STEM fields as potential careers, as noted through the report. The National Science Board (2018) also stated that less than half of fourth, eighth, and twelfth-grade students achieved a proficient or higher level on National Assessment of Educational Progress (NAEP) mathematics and science assessments in 2015. Additionally, the Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment 2015 data also showed that the U.S. average mathematics assessment scores were well below the top-performing education systems' average scores in the international arena.

With the competitive nature of programs like Race to the Top (Spring, 2014) and a need to have students in the U.S. place at the top in STEM education internationally, reform in education is needed. Lee et al. (2016) stated that "Middle school has been documented as the period in which a drop in students' science interest and achievement occurs" (p. 1). Research has shared that students lose interest in middle school STEM areas, resulting in less success in high school STEM and a lesser likelihood of continuing through STEM in college (Lee et al., 2016; Pitzer & Skinner, 2017). STEM interest may flounder as many female students "are less likely to receive familial, teacher, or peer support to pursue an education in the STEM disciplines" than their male counterparts (Ogle et al., 2017, p. 34).

Research has suggested that STEM learning differences between men and women are slight (Hyde et al., 2018). However, additional descriptors show that acknowledging differences exists between men and women (National Science Board, 2018; Stoet & Geary, 2018). Regarding the TIMSS assessment, the average scores between young men and women were six points difference (533 and 527) in science and two points differences in mathematics (519 and 517) in eighth grade (National Science Board, 2018). However, by the time young men and women are tested in high school for the TIMSS assessment in mathematics and physics, there is a stark difference between genders. Young men score an average of 455, whereas young women score 409, noting a difference of 46 (National Science Board, 2018).

In regard to gender representation in the STEM field, Sadker et al. (2009) stated that "Only one in five engineers is female, two-thirds of physics majors are male, and a lower percentage of females are studying computer science today than a decade ago..." (p. 2). The American Association of University Women (2010) indicated that there are far fewer women than men going into scientific careers, 15.1% of women are going into science, engineering, and technology areas, while 29.3% of men are majoring in those same areas. In addition, although women are more involved in certain STEM areas like biology, they are less represented in areas of engineering, computer technology, and physical sciences (Cheryan et al., 2017). According to Farrell and McHugh (2017), women make up only 28% of science researchers worldwide.

With this disparity in STEM areas, Han (2016) explained that the gender gap is observed most directly at the eighth-grade level and that this is the most significant predictor of student STEM interest. Student opinions also change regarding STEM education by the time male and female students reach the high school level. Student success drives the engagement and interest in STEM. For high school level STEM classes, success correlates with student STEM career choice (Eccles & Wang, 2016). Eccles and Wang (2016) explained that "Females placed more value than males on putting family needs before work, working with people, and having an altruistic job, while males placed more value on working with things, making more money, and seeking out high risk and high status tasks" (p. 102). Eccles and Wang (2016) also explained that interventions for young women before high school should focus on engagement in STEM. New mindsets may be altered by changing the interest and engagement in STEM for young women in STEM courses. Although it has seemed that female students' opportunities are gaining in many educational fields, STEM areas still show a need for equal female representation (National Student Clearinghouse Research Center, 2015).

Jones et al. (2017) shared that socio-emotional learning programming helps change, engage, and positively influence students' lives. Furthermore, Greenberg et al. (2017) stated that "Socio-emotional learning interventions give children opportunities to learn the life skills they need for successful development" (p. 16). Through a focus on the resources to help individuals deal with their emotions, self-regulate, and continue through difficulty, a change in the educational outlooks of individuals in STEM, may occur.

Socio-Emotional Learning

Focusing on the idea of student engagement and social learning, many middle schools have opted into studying and reviewing areas that students struggle with (Panorama Education, 2018). In Panorama Education (2018), socio-emotional learning is defined as "the critical skills and mindsets that enable success in school and in life" (para. 1). In addition, Schueller and Seligman (2010) reported the idea that successful professionals recognized engagement and meaning, stemming from their secondary educations, towards their careers as the direct route to success and contentment.

To compete with the demands and needs of the STEM industry, in particular, "people need to balance sets of cognitive, social, and emotional capabilities" (Trip, 2017, p. 1). Across the U.S., schools are seeking new methods to reach their students via socio-emotional learning. Dweck (2008) and Noddings (2005) have suggested building positive relationships with students, thus contributing to student learning successes in the classroom. There is a need for socio-emotional learning to help build this relational understanding (Devis-Rozental, 2018). There is also a need to build the skill sets to help students prepare for complications in their futures. According to Haley et al. (2017), socio-emotional learning interventions may help students in their futures. In many middle school learning environments, school districts have encouraged socio-emotional learning to promote "healthy relationships, school connectedness, and dropout prevention" (Thapa et al., 2013, p. 357). In addition, Park et al. (2014) suggested the importance of including emotion and other variables necessary to allow critical understanding and investigation in new learning. Furthermore, Kwah et al. (2016) explained that student emotions are the signals that drive STEM education, and STEM curriculum implementation should be driven by the socio-emotional learning provided by students' emotions in the classroom.

Although the Panorama Education (2018) survey includes multiple scales that measure student perceptions of teaching and learning in a particular class and at school in general, the three main components of socio-emotional learning (a) grit, (b) self-efficacy, and (c) social awareness is the focus in this study. These three areas focus on the middle school level as the areas of most concern at the school district where the first author was teaching and conducting the study. The first component of socio-emotional learning is grit and can be defined as "perseverance and passion for long-term goals" (Duckworth et al., 2007, p. 1087). Flanagan and Einarson (2017) suggested that confidence is built from perseverance and passion, and the performance of a student is directly related to their confidence. Flanagan and Einarson (2017) further explained that student grit determines how successful a student is in class. The effort one puts forward was also shown to be driven by individual grit (Von Culin et al., 2014).

The second component of socio-emotional learning is the area of student self-efficacy (Panorama Education, 2018). Self-efficacy is defined as "individuals' perceptions about their capabilities for learning or performing tasks within specific domains" (Summers & Falco, 2018, p. 2). Summers and Falco (2018) explained that students who practice strong self-efficacy tend to set and reach challenging goals while adjusting their learning environments for continued success. They also suggested that students may be influenced by socio-emotional learning to build stronger self-efficacy through positive interactions, relationships, feedback, and comparisons with peers.

The third component of socio-emotional learning is the area of student social awareness. Peters-Burton and Mattietti (2017) explain social awareness as "a greater understanding of themselves as learners" (p. xxv). The tools that students earn while focusing on social awareness allow for building skill sets that help students interpret other people accurately and help to navigate social interactions (Jones et al., 2017). Social awareness also provides positive relationships for both peers and adults. Furthermore, students using social awareness to collaborate and solve problems in social situations while working well with those around them (Jones et al., 2017).

Socio-Cultural Learning

While socio-emotional learning in middle school helps form an understanding and growth for the student (Thapa et al., 2013), there is also a need to understand students' socio-cultural learning. Parents/guardians, communities, and friends of middle school students play an essential role in student academic successes and aspirations. Through parent/guardian participation in both the home and school settings, students may receive additional academic support leading to a more friendly academic socialization of learning (Bhargava & Witherspoon, 2015).

Vygotsky (1978) described the socio-cultural theory as the method that children learn through social interactions while also explaining how the tools developed from their cultures are utilized. As Bhargava and Witherspoon (2015) described, the socio-cultural description includes various factors, such as surrounding neighborhoods, social relationships between peers and family, and teacher relationships.

In addition, students' differing cultures suggest more opportunities to learn from one another (Pinxten, 2015; Upadhyay et al., 2017). Upadhyay et al. (2017) have suggested that using "students' skills and knowledge from home and other socio-cultural experiences into science classroom instructions for sociopolitical awareness" can help strengthen classroom learning (p. 2544). The more opportunities for students to learn from those around them, the more likely they are to enhance their socio-cultural learning abilities. Also, educators' influence in the classroom may drive students' educational support and engagement (Ebadi & Gheisari, 2016).

Young women start their education interested in STEM; however, STEM begins to become uninteresting and unengaging during those formative middle school years (Lee et al., 2016). There is a need for research to address how middle school students express socio-emotional and socio-cultural perspectives in STEM learning. This study aimed to examine the gender differences of middle school students' socio-emotional and socio-cultural perspectives in STEM learning. The research questions addressed in this study are:

1. Are there significant gender differences in the socio-emotional perspectives of middle school students in STEM learning?
2. Are there significant gender differences in the socio-cultural perspectives of middle school students in STEM learning?

Method

Participants

Participants were recruited from one middle school from a large suburban school district in the Midwestern region of the U.S. In this district, 26.8% of students qualify for free and reduced lunches. The school is made up of sixth, seventh, and eighth-grade students. Students also identified their demographic information as 74% White, 5% African-American, 4% Hispanic, and 17% other. In total, 137 middle school students consented and participated in the study. Among those 137 students, 73 (53%) identified themselves as males, whereas 64 (47%) identified themselves as female.

Materials

In this research, the quantitative data were collected and investigated through a survey. The survey included 34 questions that originated from the Panorama Education Survey (2018) and Archer et al.'s (2015) survey. These questions were modified to connect to STEM learning and were assigned a Likert scale applied to all questions. An example of this modification is shared. The original Panorama Education question was worded as "How often do you stay focused on the same goal for several months at a time?" with Likert responses of "Almost always, Frequently, Sometimes, Once in a while, Almost never" (Panorama Education, 2018). The question was modified to inquire "How often do you stay focused on a STEM idea, goal, or project for several months at a time?" with Likert responses "Always, Very often, Sometimes, Rarely, and Never".

The first six questions addressed the demographic information of the participant in the survey. The following 27 questions (questions 7 to 33) utilized the 5-point Likert scale. The scale used a frequency scale between one and five, with one being "never," two being "rarely," three being "sometimes," four being "very often," and five being "always." In total, there were 18 questions (questions 7 to 24) that addressed socio-emotional learning and nine questions (questions 25-33) that addressed socio-cultural learning questions. Finally, one open-ended question (question 34) asked participants who had influenced their STEM education the most. This question was connected to the second research question.

Procedures

Before collecting data, the first author obtained permission from the Institutional Review Board (IRB) at the university she attended. After receiving IRB approval, the first author contacted the school district for consent. As soon she received approval from the school district, she then contacted parents of students digitally through email with a consent form to recruit students. This was followed up by student consent for involvement in the research. Individual assent participation was requested digitally through an email link sent from the school email. Next, the surveys were distributed and conducted on school grounds to maximize students' comfortability while also being mindful of their time. The surveys were distributed to students during the academic enrichment time. Students completed the survey digitally through school-provided technology, such as the iPad, laptop, or desktop computer. It took approximately 24 minutes for students to complete the survey.

Data Analysis

The first step of analysis with the quantitative survey was to explore the scales of measurement utilized in this research. Through the use of Qualtrics, data were exported into a spreadsheet to be organized. To analyze the data from the Likert scale, the first author coded responses using numbers, using 1 = never, 2 = rarely, 3 = sometimes, 4 = very often, and 5 = always. She looked at frequency, percentages, mean, median, mode, and range through calculations with SPSS to summarize data. Then, MANOVA tests were run to compare subscale factors. Finally, the open-ended question was coded through content analysis. The first author separated the responses into male and female responses, then counted the codes from each of the categories established to find frequencies and calculated percentages.

Result

Gender Differences in the Socio-Emotional Perspectives in STEM Learning

For the first research question, the analysis was conducted on survey questions 7 through 24 to answer socio-emotional learning related questions. Three factors were extracted through the exploratory factor analysis and were assigned as (a) grit, (b) self-efficacy, and (c) social awareness. The components of these three factors were shown in the factor loading matrix (see Table 1). The first factor, grit, had an eigenvalue of 1.34 with 7.42% of the variance, the second factor, self-efficacy, had an eigenvalue of 2.14 and 11.89% of the variance, and the third factor, social awareness, had an eigenvalue of 5.80 and contained 32.21% of the variance. Together, these three factors calculated 51.53% of the variance, which is satisfactory.

From the factor analysis, there were three questions (questions 7, 8, and 11) associated with the grit factor, seven questions (questions 9, 10, 12, 13, 14, 15, and 16) related to the self-efficacy factor, and eight questions (questions 17, 18, 19,

Table 1

Socio-Emotional Learning Factor Loading Matrix

Survey Question	Grit	Self-Efficacy	Social Awareness	Communality
7. How often do you stay focused on a STEM idea, goal, or project for several months at a time?	**0.73**	0.31		0.64
8. If you fail to reach an important STEM idea, goal, or project, how likely are you to try again?	**0.56**	0.27	0.40	0.56
9. When you are working on a STEM idea, goal, or project that matters a lot to you, how focused can you stay where there are lots of distractions?		**0.60**	0.28	0.45
10. If you have a problem while working towards an important STEM idea, goal, or project, how well can you keep working?		**0.46**	0.32	0.34
11. Some people pursue some of their goals for a long time, and others change their goals frequently. Over the next several years, how likely are you to continue to pursue one of your current STEM ideas, goals, or projects?	**0.74**			0.57
12. How confident are you that you can complete all the work that is assigned in your STEM classes?		**0.76**		0.60
13. When complicated ideas are presented in a STEM class, how confident are you that you can understand them?		**0.71**		0.54
14. How confident are you that you can learn all the material presented in your STEM classes?		**0.79**		0.34
15. How confident are you that you can do the hardest work that is assigned in your STEM classes?		**0.75**		0.57
16. How confident are you that you will remember what you learned in your STEM classes next year?	0.39	**0.51**		0.44
17. During the past 30 days, how carefully did you listen to other people's points of view in STEM?	0.37		**0.66**	0.58
18. During the past 30 days, how much did you care about other people's feelings in STEM?	0.28		**0.74**	0.63
19. During the past 30 days, how well did you get along with students who are different from you (students who are less or more interested in STEM)?		0.24	**0.66**	0.50
20. During the past 30 days, how often did you compliment others' accomplishments in STEM learning?	0.29		**0.57**	0.43
21. During the past 30 days, how clearly were you able to describe your feelings regarding STEM learning?			**0.57**	0.37
22. During the past 30 days, when others disagreed with you, how respectful were you of their views (particularly in STEM classes)?	0.25		**0.57**	0.41
23. During the past 30 days, to what extent were you able to stand up for yourself without putting others down (particularly in STEM classes)?		0.28	**0.67**	0.55
24. During the past 30 days, to what extent were you able to disagree with others without starting an argument (particularly in STEM classes)?			**0.67**	0.47
Eigenvalue	1.34	2.14	5.80	9.27
% of variance	7.42	11.89	32.21	51.53

Note: factor loadings above 0.45 are bolded and factor loadings < 0.2 are suppressed.

20, 21, 22, 23, and 24) connected the social awareness factor. In terms of reliability, the Cronbach's alpha was used to calculate the survey's reliability and each of the factor loadings. The Cronbach's alpha value for the socio-emotional portion of the survey was 0.87. The Cronbach's alpha values for the three factors of grit, self-efficacy, and self-awareness were 0.66, 0.82, and 0.83, respectively.

Through descriptive analysis, the overall means of male participants and female participants are listed regarding the components of grit, self-efficacy, and social awareness (see Table 2). In the socio-emotional learning, female participants scored higher than male participants in the grit and social awareness factors while both genders scored similarly in the self-efficacy factor. Furthermore, male and female participants were compared to find the significance of their responses to the questions involving each of the three factors (see Table 3). Results indicated a non-significant effect for female participants (M = 3.53, SD = 0.84) and male participants (M = 3.32, SD = 0.99) regarding grit, $F(1, 135) = 3.16$, $p = 0.08$. In addition, results also indicated no significance when male participants (M = 3.83, SD = 0.85) and female participants (M = 3.81, SD = 0.86) selected their answers in self-efficacy, $F(1, 135) = 0.07$, $p = 0.80$. However, there was a significance between female participants' answers (M = 4.04, SD = 0.84) and male participants' responses regarding social awareness (M = 3.70, SD = 0.95), $F(1, 135) = 11.34$, $p = 0.00$.

Gender Differences in the Socio-Cultural Perspectives in STEM Learning

For the second research question of this study, involving the socio-cultural learning questions, an analysis was conducted on questions 25 through 33. Two factors were extracted through the exploratory factor analysis and were named as (a) socio-cultural influences and (b) personal focus in STEM. The components of the two factors were shown in the factor loading matrix (see Table 4). The first factor, socio-cultural influences, had an eigenvalue of 3.63 with 40.29% of the variance. The second factor, personal focus in STEM, had an eigenvalue of 1.30 and 14.44% of the variance. Together, these two factors calculated 54.73% of the variance, which is also satisfactory.

Question 31 was cross-loaded in both the socio-cultural influences (0.47) and the personal focus in STEM (0.46) factors. For this study, we decided to keep the cross-loading to ensure vital factor components and connectedness to both factors for question 31. As a result, there were five questions (questions 26, 28, 29, 30, and 31) associated with the socio-cultural influences factor and five questions (questions 25, 27, 31, 32, and 33) related to the personal focus in STEM factor. In terms of reliability, the Cronbach's alpha value for the socio-cultural learning portion of the survey was 0.81. The Cronbach's alpha values for the socio-cultural influences factor was 0.77 and for the personal focus in STEM factor was 0.74.

Through descriptive analysis, the overall means of male participants and female participants are listed regarding the components of socio-cultural influences and personal focus in STEM (see Table 5). In the socio-cultural learning, male participants scored higher than female participants in the socio-cultural influences factor, while both genders scored similarly in the personal focus in STEM factor. Furthermore, male and female participants were compared to find the significance of their responses to the questions involving each of the two factors (see Table 6). For the socio-cultural influences factor, the results indicated there was no significance between male participants (M = 2.77, SD = 1.10) and female participants (M = 2.61, SD = 1.12), $F(1, 135) = 1.33$, $p = 0.25$. For the personal focus in STEM factor, the results indicated there was also no significance between male participants (M = 3.61, SD = 1.12) and female participants (M = 3.68, SD = 1.08), $F(1, 135) = 0.27$, $p = 0.60$.

Table 2
Descriptive Analysis of Socio-Emotional Learning Factors

Socio-Emotional Learning Factors	**Male**		**Female**	
	Mean	SD	Mean	SD
Grit	3.32	0.99	3.53	0.84
Self-Efficacy	3.83	0.85	3.81	0.86
Self-Awareness	3.70	0.95	4.04	0.84

Table 3
MANOVA Subscale Factors for Socio-Emotional

Dependent Variable	Type III Sum of Squares	*df*	Mean Square	F	Sig.	Partial Eta Squared
Grit	1.58	1	1.58	3.16	0.08	0.02
Self-efficacy	0.02	1	0.02	0.07	0.80	0.00
Social Awareness	3.99	1	3.99	11.34	0.00	0.08

Table 4
Socio-Cultural Learning Factor Loading Matrix

Survey Question	Socio-Cultural influences	Personal Focus in STEM	Communality
25. A STEM focus in college can help you get many different types of jobs.		**0.72**	0.51
26. When you are not in school, how often do you talk about STEM with other people?	**0.70**	0.26	0.56
27. I know how to use scientific evidence to make an argument.	0.23	**0.54**	0.35
28. When not in school, how often do you read books or magazines about STEM?	**0.68**	0.34	0.58
29. When not in school, how often do you go to a science center, science museum, zoo, aquarium, or planetarium?	**0.77**		0.60

30. How often are you involved in STEM related extra-curricular activities?	**0.77**		0.60
31. My teachers have specifically encouraged me to continue with STEM areas in the future.	**0.47**	**0.46**	0.43
32. My teachers have explained how STEM is useful for my future.	0.28	**0.71**	0.58
33. It is useful to know about STEM in my daily life.		**0.84**	0.71
Eigenvalue	3.63	1.30	4.93
% of variance	40.29	14.44	54.73

Note: factor loadings above 0.45 are bolded and factor loadings < 0.2 are suppressed.

Table 5
Descriptive Analysis of Socio-Cultural Learning Factors

Socio-Cultural Learning Factors	**Male**		**Female**	
	Mean	SD	Mean	SD
Socio-Cultural Influences	2.77	1.10	2.61	1.12
Personal Focus in STEM	3.61	1.12	3.68	1.08

Table 6
MANOVA Subscale Factors for Socio-Cultural Perspectives

Dependent Variable	Type III Sum of Squares	*df*	Mean Square	F	Sig.	Partial Eta Squared
Socio-cultural	0.84	1	0.84	1.33	0.25	0.01
Personal Focus in STEM	0.17	1	0.17	0.27	0.60	0.00

Influences in STEM Education

For survey question 34, male and female participants were asked who had influenced their STEM education the most. For male participants, they were mostly influenced by their teachers (N = 49 or 67.1%), then by their parents/guardians (N = 14 or 19.2%), and followed by themselves (N = 8 or 11.0%). For female participants, teachers contained the most significant influence (N = 42 or 65.6%) and were followed by their parents/guardians (N = 20 or 31.3%). However, none of the female participants stated themselves.

Discussion

Research question one investigated the gender differences of middle school participant responses and their socio-emotional perspectives in STEM learning. When factor analysis was conducted, three factors of grit, self-efficacy, and self-awareness were extracted. The results showed that female participants scored higher than male participants in the grit and social awareness factors while both genders scored similarly in their self-efficacy.

Grit is important because it is indicated as a mindset representing student ability for success regarding academic paths (Fong & Kim, 2019). Flanagan and Einarson (2017) also explained how grit levels determine student success in the classroom. Lam and Zhou (2019) shared the importance of enhancing student grit levels and how higher grit levels may influence academic achievement, especially in difficult content areas. In this study, the grit's calculated means were 3.32 for male participants and 3.53 for female participants, and there was no statistically significant difference found between genders. The results were similar to recent research (Bowman et al., 2015; Credé et al., 2017), which shows that work in the classroom regarding grit is successful, regardless of gender. As the results from this research show grit levels are similar between genders, this may suggest that educators are increasing their time spent on their students' socio-emotional learning in the classrooms. The first author observed that socio-emotional learning was a school-wide goal. The building had implemented specific learning activities to improve the socio-emotional learning of their students.

Self-efficacy is often alluded to as the predictor of student success (Bandura, 1997). Individuals who have strong self-efficacy can reach more challenging academic goals (Summers & Falco, 2018). In this study, male and female participants scored similar means for the self-efficacy factor, and no statistically significant difference was found between genders. This study's findings differed from those of Usher et al.'s findings (2019). In the conclusions of Usher et al. (2019), female students did not score as well as male participants in self-efficacy when focused on the area of mathematics, as this was considered a male-dominated content area. Also, Ropers-Huilman and Winters (2011) shared that female students were not as strong as male students when responding to STEM self-efficacy. However, the results from Falco (2019) suggested that "intervention[s] that can improve participating students', especially girls', self-efficacy for mathematics may be particularly valuable in terms of influencing their future engagement in STEM careers" (p. 39).

Social awareness is an ability for student learners to build self-confidence through individual student learning, reflections, and collaborations with peers (Peters-Burton & Mattietti, 2017). For social awareness in this study, male participants had a mean of 3.70, whereas female participants had a mean of 4.04, and there was a statistically significant difference found between genders. This study's results are similar to those of a recent study involving gender and social awareness (Wright et al., 2018). Wright et al. (2018) explained that female students focus on their emotions more than male students and that this may "promote the learning of more fine-grained and detailed emotion[al] concepts/schemas in females" (p. 156). This suggests that female students are making connections to learning emotionally. Female students are also likely to use their emotional cues to communicate with peers positively (Kret & De Gelder, 2012; Wright et al., 2018). For middle school female students, this significant difference may arise from positive role models, such as teachers in STEM classrooms, family members, community members, or STEM professionals. This transformation in social awareness may continue to lead to a positive change in STEM interest for female students.

Research question two examined the gender differences of middle school participant responses and their socio-cultural perspectives in STEM learning. When factor analysis was conducted, two factors of socio-cultural influences and personal focus in STEM were extracted. The results revealed that male participants scored slightly higher than female participants in the socio-cultural influences factor while both genders scored similarly in the personal focus in STEM factor.

For socio-cultural influences, male participants scored a mean of 2.77 and female participants scored 2.61, with no statistically significant difference found between genders. The results from the current study support findings from Kahraman and Sungur-Vurals' (2014) study. In their study, no significance between genders was found regarding the socio-cultural influences of students. Kahraman and Sungur-Vural (2014) rationalized that while the socio-cultural influences varied within the population surveyed, the population as a whole valued education. Therefore, education's importance may also be valued at the middle school that participated in the study.

An interesting observation in the socio-cultural influences factor was found when reviewing the means of other factors in this study. The calculated means for the socio-cultural influences factor from both genders were much lower than other factors reported by the middle school participants. The socio-cultural influences factor inquired upon student participation in STEM-related activities. For instance, some sample questions in this factor included the likelihood of a student speaking with other people about STEM, read books about STEM, visiting a science museum, and involving in STEM-related extra-curricular activities. Middle school students may be less likely to be interested in visiting STEM programs or conversing with others about STEM. Such disinterest may derive from engaging these activities as constraints due to homework, scheduling issues with other extra-curricular activities, or potential peer influences eluding STEM activities.

A personal focus in STEM can be defined as an individual disposition in the content areas of STEM. Male participants and female participants scored similarly, and there was no statistically significant difference found between genders. Research exploring personal focus in STEM at the middle school is absent. However, in a similar research study involving high school students, Eccles and Wang (2016) investigated student self-concepts and career aspirations studying STEM and noted a difference between genders. Female participants perceived the importance of family versus work differently from male participants, suggesting gender stereotypes in STEM were present. Similarly, in a study by Dorph et al. (2018), the gender difference was also found between high school students' personal focus in STEM. However, the results found from this study involving middle school students were different from the personal focus in STEM for those high school students (Eccles & Wang, 2016; Dorph et al., 2018). As observed and reflected by the first author, the results from this research may be due to the support of STEM educators in the middle school who attempted to strengthen student dispositions in STEM areas through facilitated STEM experiences and STEM conversations, regardless of student gender.

Finally, when asked who influenced their STEM education, both male and female participants expressed that teachers were the most influential regarding STEM encouragement. This influence signifies the importance of the teacher and student relationship, connecting to the idea of care theory (Noddings, 2005). Also, both male and female participants expressed that their parents/guardians played a significant role in influencing their STEM learning. Ing (2014) found no significant differences by gender in terms of perceived parental support in mathematics and science among seventh-grade students. There is also one notable difference between male and female participants regarding additional influences in STEM. Male participants also had added encouragement by themselves, but female students did not. This result may suggest that some male participants are more confident in their STEM skills than some of their female peers. This result is similar to the research results reported by Sadler et al. (2012) and Genareo et al. (2016).

Recommendations

This study provides three key ideas. First, the social awareness factor was significantly different for female and male middle school students. This result is essential for educators to know as this helps decipher the engagement, academic lessons, and learning differentiation necessary to reach both female and male students in STEM areas. Educators who work with students may focus on social awareness to share STEM interests, highlight collaboration in STEM, work and care for others in various STEM roles, and share information on STEM careers.

Second, the socio-cultural influences factor was the lowest-ranked factor by both female and male middle school students in this study. Introducing extra-curricular activities for students involving STEM professionals or STEM activities at the middle school level or earlier may help students comprehend real-world problems, build self-confidence, and allow for additional relationships with professionals. Teachers may also encourage their students to participate in STEM trips, STEM camps, and STEM-related activities to promote STEM learning experiences.

Third, classroom teachers also need to be aware of their influences in the classroom. In this study, close to two-thirds of both male and female middle school students reported being influenced by their teachers. Therefore, it is important for teachers to build positive relationships with students. Through positive influences from educators, students may develop stronger self-efficacy in STEM, leading to greater interest in a STEM career.

Limitations and Future Directions

Two limitations of this study are provided. The first limitation involved the student population to only one Midwestern middle-class school in the U.S. Involving a more diverse group of participants from various middle schools may have concluded with differing results. The second limitation arises from the focus of STEM in this study. Examining each content area's socio-emotional and socio-cultural factors separately (science, mathematics, engineering, or technology) regarding gender would contribute new knowledge to the field. Future research may involve studying male and female participants in a longitudinal study from elementary school, middle school, and high school levels. Additional future research may also include students of different socioeconomic statuses than what had been investigated in this study.

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