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Providing an Elementary School Environment that Encourages Girls to See their Place in the STEM Fields

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Proper APA Citation for this Article is:
https://cornerstone.lib.mnsu.edu/icitl/vol2/iss1/1
Abstract

For many years, women have been underrepresented in the Science, Technology, Engineering, and Mathematics (STEM) fields at the collegiate and professional levels. The two primary reasons for this underrepresentation are the influence of gender stereotypes and biases surrounding STEM and the lack of female role models in the STEM field. Elementary educators must do what they can to address these issues in an effort to allow girls to see their place in STEM. To help counter the influence of gender stereotypes and biases in STEM, elementary educators should integrate STEM into the classroom for all students to participate and have conversations with students about the gender discrepancies in STEM. To address the need for female role models in STEM, elementary educators should utilize classroom speakers, a diverse classroom library, an inclusive classroom environment, and an effective mentoring program to allow girls to see themselves represented in STEM. While this will not fully eliminate the gender gap in STEM, it will help girls to see their place in the STEM fields from a young age.

Keywords: STEM, gender discrepancy, women in STEM, elementary education, classroom environment
Providing an Elementary School Environment that Encourages Girls to See their Place in the STEM Fields

Introduction

Defining STEM Education

Over the last 20 years, there has been a push towards the integration of science, technology, engineering, and mathematics (STEM) in the elementary classroom. According to the U.S. Department of Education (n.d.), STEM education refers to the critical skills students develop through the integration of science, technology, engineering, and mathematics. STEM is an integrated approach to learning which emphasizes real-world and relevant experiences for students (Vasquez et al., 2013).

The Importance of STEM Education

There are many reasons why STEM education is important, especially at the elementary level. The first reason is that it allows students to develop critical 21st century skills (Brown et al., 2011; Committee on STEM Education, 2018). These 21st century skills include creativity, critical thinking, communication, and collaboration (National Education Association, n.d.; Reagan, 2016). With an integrated STEM approach, students are able to develop creativity by being challenged to find creative solutions to various problems as well as critical thinking skills as they engage in real-world problem-solving scenarios. The collaborative nature of STEM allows for the further development of communication and collaboration as students engage in activities that promote teamwork (Reagan, 2016). The development of these skills is crucial for the 21st century economy because there has been a shift from assembly line jobs to jobs that require independent, analytical thinking (Pew Research Center, 2016).
The second reason STEM education is important is because it leads to higher academic achievement in the STEM subjects. STEM integration has repeatedly resulted in increased student performance due to increased student motivation and engagement (Committee on STEM Education, 2018). Many studies have been done on the correlation between STEM integration and academic achievement (Cotabish et al., 2013; Han et al., 2015; Struyf et al., 2019), and the results consistently support the claim that STEM education leads to increased academic outcomes.

The third reason why STEM education is important is because it promotes a growth mindset (Reagan, 2016). According to Carol Dweck (2010), a growth mindset is the belief that oneself is able to overcome difficult tasks and that each person has the ability to learn and grow. Students are more apt to develop a growth mindset while participating in STEM because it allows them to engage in educational challenges, try different things, and not have to fear being wrong (Reagan, 2016).

**Gender Discrepancy in the STEM Fields**

Despite efforts being made to increase women’s participation in STEM, they continue to be underrepresented in STEM fields (Kricorian et al., 2020; Miner et al., 2018; National Science Foundation, 2016; O’Brien et al., 2015). A research study conducted in the field in 2015 indicated that women held fewer than 30% of STEM jobs despite the fact that they held close to 50% of all jobs in the United States (National Science Foundation, 2015). Also, the number of women receiving bachelor’s degrees has continually been significantly less than the number of men receiving bachelor’s degrees in the following STEM fields: computer science, engineering, mathematics and statistics, and physics (National Science Foundation, 2016). Research shows men are more likely to pursue a career in STEM than women (O’Brien et al., 2015).
Increasing Women’s Participation in the STEM Fields

The underrepresentation of women in STEM is detrimental for two reasons. First, the representation of women in STEM allows for more diversity, more creativity, and more innovation in STEM (Kricorian et al., 2020). Women bring a unique set of skills and ideas to the table, leaving the STEM field incomplete and lacking without them. Second, the National Science Foundation (2018) has reported a shortage of capable workers entering into the STEM field. According to the U.S. Bureau of Labor Statistics (2019), there is predicted to be an 8% increase in STEM occupations from 2019-2029, compared to a 3.4% increase in non-STEM occupations from 2019-2029. Increasing women’s participation in STEM is the best way to meet the growing demands of the STEM field. While studying the representation of women in STEM, Greenfield et al. (2002) said it like this, “The underrepresentation of women in science, engineering and technology threatens, above all, our global competitiveness. It is an issue for society, for organizations, for employers and for the individual” (p. 9).

Several studies have examined ways to increase women’s participation in STEM. Some of the approaches include utilizing mentoring programs for girls (Kricorian, 2020; Stoeger et al., 2013), implementing The Students Advancing through Involvement in Research Program (STAIRSTEP) theoretical framework (Doerschuk et al., 2016), offering after school STEM programs (Chittum et al., 2017), and exposing girls to successful females in the STEM field (Bottia et al., 2015; Stout et al., 2010). The purpose of this article is to describe strategies elementary teachers can use to create an environment that encourages girls to see their place in STEM.
Much of the literature surrounding gender discrepancies in STEM focuses on statistics of women’s involvement in STEM at the collegiate and professional levels (McCullough, 2011; Miner et al., 2018; National Science Foundation, 2016/2018) and explanations for the gender discrepancies in STEM (Handley et al., 2015; McCullough, 2011; Miner et al., 2018; O’Brien et al., 2015; Schuster & Martiny, 2016; Xie et al., 2015). While much of the literature focuses on women in STEM at the professional level, something should be done at the elementary level as that is when potential interventions could have the biggest impact (Brophy et al., 2008). Thus, it is critical for elementary educators to be aware of the gender discrepancies in STEM so that they can begin to evoke change.

**Representation of Women in STEM**

Studies have shown, women are less likely to participate in STEM at both the collegiate and professional levels (McCullough, 2011; Miner et al., 2018; National Science Foundation, 2016/2018). The National Center for Science and Engineering Statistics (2019) and the National Science Foundation (2016) found that 42% of the people receiving degrees in Mathematics and Statistics were women, 21% in Engineering, and 19% each in Computer Science and Physics. In contrast, the American Enterprise Institute (2016) found that 84.2% of the people who received degrees in Health Professions and related Programs were women, 82.5% in Public Administration and Social Services, 80% in Education, and 77% in Psychology.

Women also continue to remain underrepresented in the STEM workforce, especially in engineering, computer science, and the physical sciences (National Science Foundation, 2018). Women hold fewer than 30% of STEM jobs in the United States (Miner et al., 2018; National Science Foundation, 2015). Another research study found similar results (50% of total jobs and only 28% of science and engineering jobs) (National Science Foundation, 2018).

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Reasons for Gender Discrepancy in STEM

There are many different explanations for the underrepresented of women in STEM. One group of researchers identified two lenses for explaining gender inequality in STEM: the individual lens and the social-structural lens (Miner et al., 2018). The individual lens seeks to explain the gender discrepancy by identifying characteristics of individual women. The primary argument from this viewpoint suggests that women are not as interested in STEM and therefore choose to not pursue STEM as often as men do, emphasizing the woman’s choice. The social-structural lens seeks to explain the discrepancy by identifying barriers in society which discourage women from pursuing a career in STEM. An example is that women don’t pursue STEM as frequently as men because of systematic biases they’ve experienced surrounding the field. The researchers found that neither lens is correct nor incorrect, rather each on its own is incomplete. Further, they pose the idea that many of the arguments from the individual lens are actually a result of issues within the social-structural lens (Miner et al., 2018). For example, a woman might choose to not pursue a career in STEM because of biases she did not realize were affecting her. Thus, an integration of both lenses must be considered and addressed when discussing the reason for and the solutions to the underrepresentation of women in STEM (Miner et al., 2018).

Other studies indicated women in STEM are more prone to experiencing discrimination and implicit bias based on normalized assumptions of the role of women in STEM, such as being treated as though they are incapable because they are female, not being given the same opportunities as their male counterparts, or simply being told they do not have a place in STEM (Handley et al., 2015; Ito & McPherson, 2018; Schuster & Martiny, 2016). Settles et al. (2016) found that both discrimination and harassment were issues experienced by women in STEM.
Schuster & Martiny (2016) further investigated the stereotypes surrounding women in STEM. The authors found that more women experienced negative gender stereotypes surrounding STEM than men (Schuster & Martiny, 2016). Further, they found that anticipated gender stereotypes also had a negative effect on females. Males did not demonstrate the same effect (Schuster & Martiny, 2016). These findings clearly demonstrate the effects of negative stereotypes on women entering the STEM fields. These are all factors that could discourage women from pursuing a career in STEM.

There is a considerable amount of scientific evidence that suggests having a role model with shared characteristics can increase one’s likelihood of pursuing a career in STEM (McCullough, 2011; Stout et al., 2010). McCullough (2011) found the lack of female role models and mentors in STEM to be a valid reason for the underrepresentation of women in STEM; there are not an adequate number of “experts” in the field for girls to look up to (McCullough, 2011). Stout et al. (2010) found when girls were exposed to female STEM experts, they demonstrated “increased positive attitudes, self-efficacy, and connection with the discipline” (p. 14). Without a sufficient number of female role models in STEM, young girls are less likely to see themselves as having a place in STEM (Stout et al., 2010).

Various researchers argue that the gender discrepancy in STEM is a result of women’s lifestyle choices or obligations. In 2005, the president of Harvard, Larry Summers, proposed that the lack of women in STEM was a result of women prioritizing family life over spending time at work (McCullough, 2011). These researchers would argue that this claim could be supported with statistics that show women still traditionally remain responsible for more household and childcare work than men do, which could impact their ability to be fully devoted to their job.
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McCullough, 2011. While there is no substantiated research to back these claims, it is worth noting that some believe this to be a reason for the underrepresentation of women in STEM.

Similarly, additional researchers argue that the gender discrepancy in STEM can be attributed to innate abilities in mathematics or science. However, there is no data to support this claim. Research studies examining the differences between female and male achievement in K-12 education found there was no significant difference between female students’ achievement in mathematics and science and male students’ achievement in mathematics and science (Brophy et al., 2008; National Science Foundation, 2018). Despite these findings, there are still some who believe the gender discrepancy in STEM is a result of a gender discrepancy in academic ability.

Increasing Women’s Participation in the STEM Fields

Several studies have examined ways to increase women’s participation in STEM. Kricorian et al. (2020) found that girls who had exposure to a female role model in STEM were more likely to pursue a STEM career themselves. Over half (54%) of the people that responded to the same survey said that meeting a STEM professional of their same gender and ethnicity would effectively encourage them to pursue STEM (Kricorian, 2020). When girls are exposed to successful women in STEM, they are more likely to see their place in STEM (Kricorian, 2020; Stout et al., 2011; Zaniewski & Reinholz, 2016).

Similarly, Stoeger et al. (2013) found that the use of a year-long online mentoring program increased girls’ likelihood of pursuing STEM careers. They found that the following components led to more successful results: starting at an early age, having a same-sex mentor, consistent communication, on-task discussions, and as small of an age gap between mentor and mentee as possible. Girls are more likely to pursue a career in STEM if they participate in a strong mentoring program (Atkins et al., 2020; Stoeger et al., 2013).
Other researchers have examined the effects of girls’ participation in afterschool science programs (Adams et al., 2014; Chittum et al., 2017; Hughes et al., 2013; Jayaratne et al., 2003; Koch et al., 2010; Tyler-Wood et al., 2012; Watermeyer, 2012). Tyler-Wood et al. (2012) studied the effectiveness of Bringing Up Girls in Science (BUGS), a science-based afterschool program for 4th and 5th grade girls. They found that girls who participated in BUGS had greater scientific knowledge, more self-confidence in STEM, and a greater appreciation for science, though they were unable to identify a direct correlation between participation in this program and the decision to pursue a career in STEM. Chittum et al. (2017) analyzed the effects of Studio STEM, an afterschool STEM program, on students’ motivation and engagement. Chittum et al. (2017) found that afterschool programs focused on STEM could help increase students’ motivation and interest in STEM, though they didn’t specifically report on how this impacted girls’ participation in STEM. It has been conclusively shown that afterschool STEM programs are effective in increasing girls’ interest in STEM, which would increase girls’ likelihood of pursuing a future in STEM (Adams et al., 2014; Chittum et al., 2017; Hughes et al., 2013; Jayaratne et al., 2003; Koch et al., 2010; Tyler-Wood et al., 2012; Watermeyer, 2012).

**The Intersection of Race and Gender in STEM**

While the focus of this paper is on overcoming gender discrepancies in STEM, there is an even greater disconnect between the number of women in STEM and the number of Women of Color in STEM. Research studies have shown that women accounted for 29% of all science and engineering occupations while underrepresented minorities (individuals who are black, Hispanic, or American Indian or Alaska Native) accounted for only 13.3% of all science and engineering occupations; out of the 13.3%, only 5% were women (National Science Foundation, 2018/2020; Pew Research Center, 2018). While the gender discrepancy in STEM must be addressed, the
intersection of race and gender in STEM cannot be ignored. Further research is needed to address this ongoing issue.

Application

How to Encourage Women’s Participation in STEM from a Young Age

One of the most important things educators can do to increase women’s participation in STEM is to start interventions while the girls are still young. By the time they are 12 years old, most girls have already experienced stereotypes surrounding their involvement in STEM (Brophy et al., 2008). Before they complete middle school, many girls have already made up their minds about whether or not they will pursue a career in STEM. By engaging in STEM education and having the opportunity to see their place in STEM at a young age, girls will be more likely to consider pursuing a future in STEM when that time comes.

What does it mean to “start young?” There are many things educators should do to address both the individual lens and the social-structure lens in an effort to encourage girls to see their place in STEM education, remembering that often the components of the individual lens are a result of components of the social-structural lens. Educators should integrate STEM education in the elementary classroom, giving all students a chance to participate. They should invite women from STEM fields into the classroom as guest speakers, allowing girls to see and talk with potential role models. Educators should diversify their classroom library in an effort to include books that represent women and Women of Color in STEM and make sure their classroom does not masculinize the STEM subjects any further. Educators should verbally address any instances of bias or stereotyping they encounter in their classroom. Additionally, they should advocate for the implementation of a mentoring program, as well as an afterschool STEM program, specifically for girls in STEM. A combination of these things could help young
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girls, including young Black and Brown girls, to see their place in STEM, thereby opening the door for them to consider a future in a STEM field.

**Provide STEM Opportunities for All Students**

Educators must commit to engaging all students in STEM, as it is important for all students to have access to STEM education (U.S. Department of Education, n.d.). This access should not depend on gender, race, ability, or socioeconomic status. This means STEM integration should take place when all students are able to partake, during the school day. It should not solely take place before or after school, while students are being pulled out, or as an elective where students must choose between multiple activities. Specifically, girls, including Black and Brown girls, must have the same access to STEM as boys do as it will help them to view themselves as capable of participating in STEM.

The nature of STEM allows for it to easily be integrated into the elementary classroom without the teacher having to make too many changes or modifications to his/her practice. The purpose of STEM education is to engage students in real-world scenarios that are cross-curricular, meaning the students are engaged in more than one STEM discipline at a time. This could be the integration of science and mathematics, mathematics and technology, science, engineering, and technology, or any other combination of the four disciplines. There are many websites designed to help educators begin the process of implementing STEM integration in their classrooms. One example is [www.teachengineering.org](http://www.teachengineering.org). This site offers free STEM curriculum for K-12 classrooms. Educators can search by grade, subject area, or lesson idea. It is easy to use and could serve as a great first step for educators wanting to implement STEM integration.

**Provide Examples of Role Models**

[https://cornerstone.lib.mnsu.edu/icitl/vol1/iss2/1](https://cornerstone.lib.mnsu.edu/icitl/vol1/iss2/1)
Classroom Speakers

Based on the knowledge that many girls experience gender biases and stereotypes in STEM, educators must do what they can to dismantle these ideas. One of the most effective ways to combat these stereotypes is to expose students to examples of successful women and Women of Color in STEM related fields (Dasgupta & Stout, 2014). Educators should arrange for women in STEM to come in as guest speakers. These guest speakers could include any women currently working in a STEM field. For example, if the students are doing a project where they are learning about civil engineering by building bridges in class, the teacher might choose to have a female engineer come teach a lesson or speak to the class about what goes into an actual building project. While this is a great way of exposing girls to potential role models in STEM, the lack of women in STEM positions could potentially make this challenging (McCullough, 2011). If guest speakers aren’t available or the teacher is unable to find a local woman in a particular field, there are a plethora of resources online that represent women in STEM fields. See Appendix A for a list of websites that could be used to showcase women in STEM in the classroom. These resources could be used for research projects, student biographies, or as varying perspectives on scientific topics. Educators must expose students to the idea that women, including Black and Brown women, can be successful in STEM (Kricorian et al., 2020).

Classroom Libraries

Another way that educators can combat these gender stereotypes is by promoting classroom libraries that include STEM related books with women and Women of Color as main characters. If every STEM related book has a male lead, the gender stereotype surrounding STEM will only be perpetuated; educators must include books that showcase women in STEM in their classroom libraries. In addition to providing students the opportunity to read and interact
with these books, teachers can utilize these books as read-alouds to foster classroom discussions. To start, educators should examine the books they have in their classroom libraries and ask themselves if women and Women of Color are being fairly represented in STEM related books. If the answer is no, educators should seek to add more diverse books that feature women and Women of Color in STEM. See Appendix B for a list of suggested books. The inclusion of books (biographies) that feature women and Women of Color in STEM allows for girls to see that they have a place in STEM (Stout et al., 2010).

**Classroom Environment**

Educators should look at how they portray science and mathematics in their classrooms. Are the examples of scientists or mathematicians mostly men? Are primarily “masculine” colors used to portray these subjects? For example, many teachers choose to hang up posters in their classrooms. If all of the posters displayed in a classroom contain male scientists or mathematicians (i.e. Albert Einstein, Isaac Newton, Thomas Edison, etc.), girls begin to believe the stereotype that STEM is for men (Charlesworth & Banaji, 2019). Instead, educators could invest in posters that feature diverse figures in STEM, including both women and minorities. Educators must evaluate subtle ways that they may perpetuate these biases or stereotypes by reflecting on their classroom environment. Then, they must commit to making the changes necessary to ensure women in STEM are being fairly represented in their classrooms, and that they are not further perpetuating gender stereotypes in STEM education.

**Have Conversations**

Educators must speak up when they hear evidence of any gender biases or gender stereotypes in their classroom as this could help to break potential gender stereotypes (Lewis Jr. et al., 2019). For example, if a girl is playing with Legos and a comment is made about Legos

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being for boys, the teacher should step in and speak against the stereotype being spoken. Along those same lines, educators should avoid creating scenarios where students are assigned an activity based on their gender. For example, educators should not say “boys can play with Legos and girls can color,” as statements like this only perpetuate the stereotypes. Educators should encourage all students in all activities, regardless of their gender.

While it is important for educators to interject as they hear instances of gender biases or stereotypes, it is even more important for educators to have direct conversations with their students addressing the gender stereotypes in STEM. Educators should inform their students of the gender discrepancy in STEM and explain why there is such a discrepancy. This could give educators an opportunity to explicitly speak against the stereotypes that girls may encounter (i.e. that boys are naturally better at math and science, that girls can’t handle the workload in STEM, and that girls do not belong in STEM). These types of conversations could take place within the context of a STEM activity, while discussing well-known scientists or mathematicians, or even within the context of a “what do you want to be when you grow up” classroom activity. Educators have a unique influence on students’ ideas and perceptions. They should use their voice to speak up and speak out against gender stereotypes and biases in STEM so that girls know they have a place in STEM (Lewis Jr. et al., 2019).

**Establish a STEM Mentoring Program for Girls**

Educators should advocate for the establishment of a strong, research-based STEM mentoring program for girls. This is the approach best supported by research to increase girls’ likelihood of pursuing a future in STEM. While there have been many studies that focus on the effectiveness of mentoring programs for girls, there is some variation in how these programs are
executed. There are, however, some qualities or characteristics that have proven to be more successful.

Stoeger et al. (2013) identified six characteristics of a successful online STEM mentoring program for girls, however these practices could be adapted for a face-to-face mentoring program as well. First, girls should be paired with a mentor of the same sex. This can be challenging, as there are a limited number of women in STEM fields, however it is a crucial component of an effective mentorship (Stoeger et al., 2013). This is important because it really allows girls to see themselves in the STEM field. While a mentorship between members of the opposite sex could be beneficial, the most effective programs paired girls with same-sex mentors.

Second, the mentorship program should start as early as possible, as without intervention, girls’ likelihood of pursuing STEM diminishes as time goes by (Stoeger et al., 2013; LaForce et al., 2016). Studies show that waiting until girls are in high school is too late because, by then, they will have already been exposed to the gender stereotypes and biases that deter them from seeing their place in STEM. Mentorship programs would ideally start in elementary school.

Third, there should be frequent interaction between the mentor and the mentee. Stoeger et al.’s (2013) study recommends interactions at least once a week. This frequent interaction could be face-to-face or virtual, but it’s important for communication to be consistent. Along the lines of communication, the fourth characteristic of an effective mentoring program is that the mentor must share knowledge, answer questions, offer guidance, and serve as a counselor for the mentee. The mentor should be a professional who is able to assist and guide the mentee (Stoeger et al., 2013). Mentoring programs are effective because they give girls the space and time to actually envision themselves in STEM. One way this can happen is by girls getting the chance to
ask questions and learn more about a potential future in STEM. An effective mentoring program should allow for clear, consistent, open communication between the mentor and the mentee.

Next, the most effective mentorship arrangements are between mentors and mentees close in age (Stoeger et al., 2013). This helps the mentee see themselves in STEM. It is important to note that this is not always achievable. Again, due to the lack of women in STEM fields, it can be hard to find potential women mentors, especially ones that are younger or closer to the girl in age. However, researchers have found that the closer the mentor and mentee are in age, the better. It can also be beneficial for mentees to have access to a broad number of mentors rather than just one, as this increases their exposure to women in STEM (Stoeger et al., 2013). Again, this might not always be possible, but it has proven to be beneficial for the girls in the mentorship program.

Finally, if the mentorship is conducted virtually, a rich STEM environment can be created in the form of chat rooms, forums, or STEM focused discussions. This type of an online environment can help educate and inspire girls (Stoeger et al., 2013). This could allow for collaboration or discussion amongst mentors and mentees, and it could better help girls see their place in STEM.

**Establish an Afterschool STEM Program for Girls**

In addition to advocating for a strong mentoring program, educators should also advocate for an afterschool STEM program for girls. Girls who participate in an afterschool STEM program are more confident in their scientific knowledge and abilities, are more likely to view themselves as capable in STEM, and are more interested in STEM topics (Adams et al., 2014; Chittum et al., 2017; Hughes et al., 2013; Jayaratne et al., 2003; Koch et al., 2010; Tyler-Wood et al., 2012; Watermeyer, 2012). These three things have a direct impact on girls’ eventual
decision to pursue a career in STEM. Providing girls with an afterschool STEM program opens the door for girls in STEM.

The Need for Reflection

Educators must make it a priority to reflect on their practice in order to shape their own critical lens in an effort to increase girls’ participation in STEM. Researchers have conclusively found that reflection is a critical practice in education (Marcos & Tillema, 2006). When teachers take the time to reflect on their own internal biases surrounding women in STEM, they are able to develop their own critical lens which impacts their instructional decisions.

Educators should ask themselves and honestly reflect on the following questions: How am I perpetuating stereotypes and biases surrounding women in STEM, intentionally or unintentionally? How am I representing women in STEM in my classroom? Are women in STEM being represented in my classroom? What about Women of Color in STEM? How are girls positioned in my classroom, specifically in regard to STEM subjects? Do girls have equal opportunities as boys to participate in STEM? What am I doing in my classroom to dismantle the stereotypes surrounding women in STEM? Is there anything else I can be doing to better address this issue? What opportunities do I have to encourage girls to see their place in STEM? By taking time to honestly and repeatedly reflect on these questions, educators are better able to identify areas of innate biases, better dismantle these stereotypes and biases, and better encourage girls to see their place in STEM.

The Need for Systematic Change

While the focus of this paper is on what educators can do to encourage girls to see their place in STEM, these strategies alone will not solve the gender discrepancy dilemma in STEM. Systematic changes must take place. For example, one of the most successful methods for
increasing girls’ participation in STEM is the use of a mentoring program. While educators can advocate for this type of program or even work to organize this type of program, educators don’t make decisions about funding. Without adequate funding, this type of program would not be possible. Further, part of the gender discrepancy in STEM can be attributed to STEM companies not hiring women or Women of Color at the same rate that they hire men. One study sought to uncover discreet gender biases in the hiring process by presenting science faculty with identical application materials, only differing by gender/name. They found that both male and female faculty tended toward the male applicants and offered the female applicants considerably smaller starting salaries despite the males and females presenting identical application materials (Moss-Racusin et al., 2012). While educators can help to less the gap, there are some things that fall outside of the control of educators. These issues must be addressed at a higher level.

Discussion

Women in STEM?

Data has conclusively shown that women are underrepresented in STEM (Kricorian et al., 2020; Miner et al., 2018; National Science Foundation, 2020). This is true in college STEM courses and programs, in STEM careers, and in leadership positions within STEM fields. With the growing number of STEM jobs and the increasing demand for these jobs to be filled, something must be done to increase the participation of women in STEM education. Women bring a unique sense of creativity, problem solving, and critical thinking skills to the table. Because women are not fairly represented in STEM, these ideas and approaches are not being utilized. Until women are fairly represented, the STEM field will continue to be a male-dominated field, which only perpetuates the gender stereotype surrounding STEM and further
discourages women from pursuing it. Something must be done to increase women’s participation in STEM.

**Why is There a Discrepancy and What can Elementary Educators do?**

The gender discrepancy in STEM can be attributed to many factors, the most prominent being girls’ self-perceptions due to gender biases or stereotypes surrounding STEM (Handley et al., 2015; Ito & McPherson, 2018; Schuster & Martiny, 2016; Settles et al., 2016) and a lack of female role models in STEM for girls to look up to (McCullough, 2011; Stout et al., 2010).

Elementary educators must do everything they can to address these two factors in order to lessen the gender gap and encourage girls to see their place in STEM. There are four strategies outlined in this article that elementary educators can utilize: providing STEM opportunities for all students; having conversations addressing gender biases or stereotypes in STEM; exposing girls to potential role models in STEM; advocating for a strong mentoring program for girls.

In an effort to address the gender stereotypes and biases surrounding STEM from a young age, elementary educators should provide STEM opportunities for all students and have conversations with their students about these gender stereotypes. It is important for elementary educators to integrate STEM into the general education classroom (U.S. Department of Education, n.d.). This opens the door for all girls to begin to see their place in STEM from an early age, before they are exposed to and influenced by too many gender stereotypes. By participating in STEM, girls will begin to feel like they are capable of participating in STEM, which will result in girls feeling like they have a place in STEM. Further, educators should have conversations with their students surrounding biases or gender stereotypes in STEM (Lewis Jr. et al., 2019). Educators should “call out” instances of false stereotypes and should initiate conversations with students about girls’ place in STEM. Educators often are very influential in
young students’ lives (Split et al., 2012); girls could be very positively impacted by a teacher’s encouragement toward STEM. These two strategies could counteract the gender stereotypes the girls will encounter and help girls to see their place in STEM.

The other biggest factor deterring girls from pursuing STEM is the lack of exposure to female role models in the field. There are two ways elementary educators can address this issue: exposing girls to potential role models and advocating for the use of a strong mentoring program. Educators should expose girls to potential role models in STEM, which can be done in a variety of ways: via classroom speakers, an inclusive and diverse classroom library, or an intentional classroom environment setting. By exposing girls to successful women in STEM, girls are better able to see themselves in the STEM field (Charlesworth & Banaji, 2019; Dasgupta & Stout, 2014; McCullough, 2011; Stout et al., 2016). It is important to note that this exposure should include both women in STEM as well as Women of Color in STEM. Educators should also advocate for the development of a strong STEM mentoring program for all girls (LaForce et al., 2016; Stoeger et al., 2013). This could be in-person or virtual, but many studies have proven the effectiveness of increasing girls’ participation in STEM through the use of a mentoring program. These two practices could help elementary aged girls to see their place in STEM.

**Future Directions for this Topic**

The concept of STEM integration has been around for less than 20 years (National Science Foundation, 2001), which means what we know about STEM is still evolving and developing. Further and continual research must be conducted on this topic. Specifically, there is a need for longitudinal studies to be conducted on the effectiveness of STEM interventions at the elementary level. These studies should follow girls and boys of all races and ethnic backgrounds from elementary school through adulthood in an effort to calculate the effectiveness of the
following strategies: Integrating STEM into the elementary classroom so all students can participate (U.S. Department of Education, n.d.), bringing in classroom speakers (Dasgupta & Stout, 2014; Kricorian et al., 2020), diversifying classroom libraries (Stout et al., 2010), evaluating classroom environments (Charlesworth & Banaji, 2019), having conversations about gender discrepancies in STEM (Lewis Jr. et al., 2019), and establishing a strong mentoring program (Stoeger et al., 2013). Did the interventions actually impact the students’ future career choices? Which strategies were most effective? Did they increase both girls’ and boys’ participation in STEM? More research studies employing all three types of research methodologies (quantitative, qualitative, and mixed) in different settings need to be conducted. In doing so, educators would have a better understanding of which strategies best encouraged girls to see their place in STEM.

Though it is not the focus of this paper, there is also a need for systematic change in regard to gender equality in STEM. Continued studies must be done on the systematic reasons for the gender discrepancy in STEM. Do women have the same access to STEM as men do (Moss-Racusin et al., 2012)? What about Women of Color? Is the system flawed? What can be done to address the social-structural lens of gender inequality in STEM? These are questions that must also be addressed in order for further change to occur.

Conclusion

Women deserve to be fairly represented in STEM. For too long, gender biases and stereotypes have allowed for STEM to remain a male dominated field. The lack of women in STEM only makes it more difficult for women to see their place in STEM, further perpetuating the issue. The most effective interventions for lessening the gender gap in STEM should begin in elementary school, before girls have been led to believe that STEM is for men. Elementary
educators should do everything they can to help girls, especially Girls of Color, to see their place in STEM so that as girls grow up, they are able to decide for themselves if they want to pursue a career in STEM. By following the strategies outlined in this article, in particular, bringing females and females of color in a prominent position in the classroom through books and mentoring, elementary educators can help encourage girls to see their place in STEM.
References


https://ncses.nsf.gov/pubs/nsf19304/


The state of American jobs: How the shifting economic landscape is reshaping work and society and affecting the way people think about the skills and training they need to get ahead.


## Appendix A

### Resources for Highlighting Women in STEM in the Classroom.

<table>
<thead>
<tr>
<th>Website</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="https://obamawhitehouse.archives.gov/women-in-stem">https://obamawhitehouse.archives.gov/women-in-stem</a></td>
<td>This website gives personal stories about women involved in STEM.</td>
</tr>
<tr>
<td><a href="https://thebestschools.org/features/50-top-women-in-stem/">https://thebestschools.org/features/50-top-women-in-stem/</a></td>
<td>This website gives information about the top 50 women in STEM.</td>
</tr>
<tr>
<td><a href="https://www.globalcitizen.org/en/content/17-top-female-scientists-who-have-changed-the-world/">https://www.globalcitizen.org/en/content/17-top-female-scientists-who-have-changed-the-world/</a></td>
<td>This article details 17 female scientists that left an impact on the world.</td>
</tr>
<tr>
<td><a href="https://www.teachervision.com/women-stem">https://www.teachervision.com/women-stem</a></td>
<td>This website gives information about women in all areas of STEM.</td>
</tr>
<tr>
<td><a href="https://ssec.si.edu/girls-and-women-in-stem">https://ssec.si.edu/girls-and-women-in-stem</a></td>
<td>This portion of the Smithsonian Science Education Center’s website gives resources for students to learn more about women in STEM.</td>
</tr>
</tbody>
</table>
## Appendix B

Elementary Level Books That Feature Women in STEM.

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
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<tbody>
<tr>
<td><em>Shark Lady: The True Story of Eugenie Clark</em> by Jess Keating</td>
<td></td>
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<tr>
<td><em>Grace Hopper: Queen of Computer Code</em> by Laurie Wallmark</td>
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<tr>
<td>The Amazing Scientist Series by Julia Finley Mosca:</td>
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<td><em>The Doctor with an Eye for Eyes: The Story of Dr. Patricia Bath</em></td>
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<tr>
<td><em>The Girl Who Thought in Pictures: The Story of Dr. Temple Grandin</em></td>
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<tr>
<td><em>The Girl with a Mind for Math: The Story of Raye Montague</em></td>
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<tr>
<td><em>The Astronaut With a Song for the Stars: The Story of Dr. Ellen Ochoa</em></td>
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</tr>
<tr>
<td><em>Rosie Revere, Engineer</em> by Andrea Beaty</td>
<td></td>
</tr>
<tr>
<td><em>Ada Twist, Scientist</em> by Andrea Beaty</td>
<td></td>
</tr>
<tr>
<td><em>Swimming With Sharks: The Daring Discoveries of Eugenie Clark</em> by Heather Lang</td>
<td></td>
</tr>
<tr>
<td><em>The Fourteenth Goldfish</em> by Jennifer L. Holm</td>
<td></td>
</tr>
<tr>
<td><em>Finding Wonders: Three Girls Who Changed Science</em> by Jeannine Atkins</td>
<td></td>
</tr>
<tr>
<td><em>Women in Science: 50 Fearless Pioneers Who Changed the World</em> by Rachel Ignotofsky</td>
<td></td>
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<tr>
<td><em>Me... Jane</em> by Patrick McDonnell</td>
<td></td>
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<tr>
<td><em>Mae Among The Stars</em> by Roda Ahmed</td>
<td></td>
</tr>
<tr>
<td><em>I Am Marie Curie</em> by Brad Meltzer</td>
<td></td>
</tr>
<tr>
<td><em>Who Says Women Can’t Be Doctors? The Story of Elizabeth Blackwell</em> by Tanya Lee Stone</td>
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</table>
Play-based Learning in the Early Childhood Mathematics Classroom: Culturally Sustaining Play

Makenzie Evans
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Makenzie Evans is a kindergarten teacher in Mankato, Minnesota. Makenzie graduated in 2012 from Minnesota State University majoring in Elementary Education with a specialty in middle school mathematics. After years of teaching first grade and kindergarten, she knew she wanted to find a graduate program that emphasized elementary mathematics. Makenzie believes that early childhood mathematics should be centered around structured, yet imaginative, play within the classroom. She encourages children to make connections to the world and focuses on creating a culturally sustaining experience for children to connect their home and school learning. When Makenzie is not teaching, she enjoys spending time with her family and visiting as many parks as possible!

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Proper APA Citation for this Article is:
https://cornerstone.lib.mnsu.edu/icitl/vol2/iss1/2
Abstract

The purpose of this paper is to explain the importance of play-based learning in early childhood mathematics classroom through culturally sustaining experiences. Approaches to providing culturally sustaining play-based learning within the classroom will be described. The intent is to provide instruction that allows students to be able to connect their imagination and real-world experiences to their mathematics learning through play.

Keywords: math, play, early childhood education, culturally sustaining
Classroom teachers often understand that play helps engagement within the classroom. However, in many cases, play tends to be activities such as online games that promote mathematics through memorization rather than exploration and reasoning. This paper will focus on how teachers can include play-based learning in the early child mathematics classroom, beyond online computer games. It is important that students have access to play-based learning in the early childhood mathematics classroom while experiencing a culturally sustaining environment (Zippert et al., 2019; Worthington & Van Oers, 2016). Hauser (2005) claims that kindergarten students are highly eager to learn and that play can be a powerful vehicle for learning (as cited in Vogt et al., 2018, p. 592). Early childhood curriculum often reverts to counting and memorization when in reality naturalistic play can lead to broader mathematical thinking and understanding. Children learn in many different ways and it is important to include hands-on learning experiences during mathematics (Graue et al., 2014).

Theorists are not able to agree upon one way to define the word play. Therefore, the term play-based learning can have various definitions. Vogt and colleagues (2018) state that “play can be defined as activities that are fun, voluntary, flexible, involve active engagement of the child, have no extrinsic goals, and often have an element of make-believe” (p. 592). This definition aligns with children needing to have time to play with manipulatives and new concepts through play-based learning. Children need time to choose activities to demonstrate their mathematical thinking and understanding through play (Parks, 2015).

Research suggests that play-based learning can be beneficial for all students and offers various ways to learn and display mathematical knowledge (Vogt et al., 2018, p.
Play allows children to demonstrate their learning through both telling and showing (Wallerstedt & Pramling, 2012, p. 13). Often play within the early childhood classroom is found to be a separate part of the day and used as a break from learning in the elementary classroom. Wallerstedt & Pramling (2012) claims that play is encouraged by educators in preschool but often neglected once kindergarten begins due to the push of academics in a traditional manner (p. 7). Play can be extremely powerful if designed around mathematical concepts and driven by the child’s lead (Parks, 2015). Play can be enriched when teachers enter play and assist with materials, ideas, and questioning (Samuelsson & Johanson, 2004). Parks (2015) noted that “the point is not that children will master these mathematical concepts through play, but that they develop ways of understanding the world that they will bring to their engagements with mathematics and that teachers can leverage consciously when discussing new concepts” (p. 14). Play-based learning can be joined with culturally responsive teaching to incorporate a culturally sustaining classroom. Gay (2002) proposes including cultural characteristics and experiences of diverse students to engage students in learning (as cited in Bottoms et al, 2017).

Therefore, the purpose of this paper is to explain the importance of play-based learning in early childhood mathematics classroom through culturally sustaining experiences. Approaches to providing culturally sustaining play-based learning within the classroom will be described. The intent is to provide instruction that allows students to be able to connect their imagination and real-world experiences to their mathematics learning through play.

**Review of Literature**
It is essential that students have access to play-based learning in the early childhood mathematics classroom in order to develop broader mathematical thinking and understanding. Authentic play allows for real-time experiences that can be intertwined with mathematical thinking and understanding (Graue et al., 2014).

**Theories on Play**

There are several theories that have guided the types of play within a classroom. Most researchers can agree that activities must be freely chosen by the child in order to be classified as play (Parks, 2015). Vygotsky believes that imagination and prior experiences are crucial to children’s learning and play. He also supports that play is an integral piece to children’s learning (Magnusson & Pramling, 2017). Van Oers highlights that play requires freedom in sense that children can freely move in and out of activities (Magnusson & Pramling, 2017). Piaget believes that through play and exploration that students develop a mathematical understanding while using ordinary objects to construct meaning. The experiences occur naturally in the course of play and exploration (Tudge & Doucet, 2004). Piaget’s theory of cognitive development explained that children move throughout four stages of mental development. Early childhood children are in the Preoperational Stage (ages 2-7 years) and gain knowledge through imaginary play using their senses (Ghazi, 2014).

Incorporating play-based learning into mathematics includes opportunities for students to work with materials that likely promote mathematical thinking. Children need exposure to new concepts through teacher guidance and then time to build on those concepts in their own play. Children working with manipulatives during play allows
students to develop mental representations which leads to abstract representations (Parks, 2015).

**Play-Based Mathematical Learning**

Children need formal mathematical lessons to have exposure to new concepts and time to build off that knowledge during play-based activities. Allowing children to have repeated exposures to manipulatives allows students to build confidence, competencies, and creativity which leads to developing more complicated scenarios (Parks, 2015). Worthington & Van Oers (2016) mention that sustained play encourages ideas to be explored and developed. Sustained play also allows for students to circle back to previously taught concepts (p. 59). Play-based learning promotes students’ engagement with materials in real-world scenarios and mathematical conversation with peers. Children often demonstrate understanding through play, both verbally and nonverbally. For example, Zippert and colleagues (2019) found that spatial relations, enumeration, and magnitude is often verbally expressed, while pattern and shape understanding is often expressed nonverbally (p. 2). Children should also have an opportunity to come together each day and converse about their mathematical thinking during play (Parks, 2015).

**Culturally Responsive Teaching**

In order to make play-based mathematics meaningful, it is important for teachers to understand student interest and diverse backgrounds. Implementing culturally responsive teaching in the classroom can help students build their identities and allows for students to make meaningful connections to their learning in the mathematics classroom. Ukpokodu (2011) defines culturally responsive teaching as an approach that uses students’ cultural knowledge as an integral part of the planning and teaching process.
to increase student engagement (p. 48). Teachers displaying culturally responsive pedagogy in their classroom highlight cultural characteristics, experiences, and perspectives of ethnically diverse students to develop culturally sustaining environments (Bottoms et al., 2017). Culturally responsive teaching has the capability of making math successful for students with non-dominant cultural backgrounds when connected to their identities. The National Council of Teachers of Mathematics has developed standards regarding teachers’ understanding of how students’ diverse backgrounds influence their learning in mathematics (NCTM, 2008).

**Home Connection**

Children begin learning math well before entering the school system. The child’s home environment can play a large part in the impact of student’s mathematical thinking. Each child brings to school a strong sense of personal cultural knowledge and it can be made evident through play. It is important to learn and acknowledge their culture within the classroom in order for all students to know they matter and are welcome (Worthington & Van Oers, 2016). Children enter kindergarten at many different levels of mathematical thinking exposure depending on their home learning environments (Vogt et al., 2018). Mathematical thinking from a young age can be used as a predictor for later success in school (Cohrsen & Niklas, 2019).

**Long-term Impact**

Children’s early mathematical experiences are connected to their mathematical understanding and begin to build the foundation to their cognitive development (Tudge & Doucet, 2004). It is evident that early mathematical understanding and foundation is linked to long-term success for students (Claessens, 2009; Cohrsen & Niklas, 2019;
Hofer et al., 2013). Incorporating play-based learning in mathematics at a young age can encourage conceptual knowledge that leads to a deeper understanding. Play-based learning during mathematics encourages students’ curiosity and enthusiasm while allowing students to work through challenges that builds knowledge needed for abstract mathematical thinking needed throughout life (Piccolo & Test, 2010). The skills learned in early childhood mathematical settings are highly connected to later mathematical outcomes (Duncan et al. 2007; Grussing & Petter-Koop 2008, as cited in Vogt et al, 2018).

Traditional Curriculum

Focusing on traditional curriculum within the classroom does not meet the needs of most students and is missing sufficiently challenging material. Often times traditional curriculums teach content that students already know and therefore only benefit a portion of the class. Traditional curriculum that is taught as a whole group tends to leave higher level students with a sense of boredom. Play-based learning in mathematics serves all children and is considered to be more fun (Vogt et al., 2018). Play-based learning fosters naturalistic play experiences that expands mathematical thinking and understanding in an age-appropriate manner (Graue et al., 2014). Ukpokodu (2011) suggests that traditional curriculum, policies, and teaching practices do not engage diverse and low-income students (p. 48).

Application

Types of Play

When creating play-based learning in the classroom there are several types of play to consider. Children may choose their own play or enter an adult-initiated type of play.
By choosing their own play, it aligns with Parks’ (2015) emphasis on play needing to be freely chosen by the children involved (p. 5). Within the classroom setting it can be common for children to enter play through an adult-initiated type of activity, which can also be referred to as guided play. In this case the adult is structuring the play but leaving much control to the children (Vogt et al., 2018).

Children may choose to play independently, in parallel, or cooperatively with peers. Zippert and colleagues (2019) find that children playing cooperatively with peers demonstrates collaboration and allows for more effective problem-solving skills than playing independently (p. 3). Each type of play affords students the opportunity to communicate their mathematical understanding through conversation (Zippert et al., 2019).

Teacher Role

Teachers have many important roles in guiding students to participate in the play-based learning of mathematics. It is important for teachers to make it meaningful by setting the stage for mathematical play, providing adequate play time, entering play with children, and meeting the diverse needs of students.

Make it Meaningful

In order to make play-based learning meaningful and allow for mathematical learning within, teachers must be committed to implementing the play-based approach (Vogt et al., 2018). Children’s play should be built upon everyday experiences and should not form a gap between everyday mathematical experiences and institutionalized mathematics (Magnusson & Pramling, 2017). It is important to have a well-rounded understanding of students’ interests to build into play to encourage student acceptance.
Teachers are able to enhance children’s mathematical understanding by introducing new concepts and encouraging play that involves those new ideas afterwards (Graue et al., 2014).

Setting Up Play

Teachers should introduce and allow manipulatives to be used within play on a regular basis. It is important to organize materials in a way that promotes mathematical thinking and that children can easily access them. It is important to remember that children should be introduced to these tools first and then allowed repeated exposure throughout time (Wallerstedt & Pramling, 2012). Children show mathematical understanding through exploration of materials both verbally and nonverbally. Zippert and colleagues (2019) found that children often demonstrate understanding of patterns and shapes nonverbally, while the understanding of spatial relations, enumeration, and magnitude is shown verbally through conversation with peers or adults (p. 7). There are many possibilities when deciding which tools to incorporate in your mathematical learning space; below are a few ideas to set up your classroom.

Blocks. Children can explore many different types of blocks to promote building structures, exploring equivalent lengths, and creating 3-D shapes. A few ideas include wooden blocks, magnetic tiles, large brick blocks, and Lego blocks. To build upon these skills as the year goes on, teachers may add sets of families or animals, pictures of structures, and cars to further mathematical thinking (Parks, 2015).

Puzzles. Children can manipulate shapes, recognize shapes, and practice rotation skills through building puzzles. The number of pieces and complexity of the picture contribute to the difficulty of the puzzle. Children need to be encouraged to find the best
fit puzzle to encourage mathematical thinking. Once a student can easily do a puzzle from memory, they are ready to move on to the next level of puzzle. Classrooms can also use pattern block puzzles which can be scaffolded in difficulty ranging from pictures that include the color and diagram of each shape to be used all the way to a blank picture that students must fill in with shapes that they choose (Parks, 2015).

**Object Collections.** Children can be encouraged to use buckets of small materials to count, sort, compare and make sense of larger numbers. It is important that these objects are changed out often throughout the year to encourage engagement. Object ideas include mini erasers, beans, shells, bears, coins, and beads (Parks, 2015).

**Sensory Tables.** Filling up a table with small sensory items such as beans, pasta, rice, and water allows for children to engage in filling and emptying containers. This skill is important in building a basis for understanding capacity.

**Measuring Tools.** There are many manipulatives used during the year that can be incorporated into play-based learning, rather than 2-3 individual lessons throughout the year. Balances, measuring tapes, measuring cups, rulers, and scales are a few items that can encourage measuring during play (Parks, 2015).

**Play-Doh.** Children can use Play-Doh to practice comparing, build number sense, number formation, creating shapes, and dividing materials in multiple groups. To build upon skills, teachers may add pictures of objects that students can recreate or challenges that students can solve (Parks, 2015).

**Pretend Play.** It is essential that manipulatives are available to encourage mathematical thinking during pretend play scenarios, also known as dramatic play. Edo and colleagues (2009) designed activities around setting up the pretend play as a class
and making decisions together to design the space (pp. 331-333). The play can become more meaningful when teachers and students work together to decide what type of shop will be set up and come up with a plan to get the shop ready.

Children may choose to set up several different types of pretend play that encourage mathematical thinking. Examples of pretend play centers include the following:

- a café, where they practice following a recipe and handling payments;
- a doctor’s office, where they practice weighing, measuring, and taking temperatures;
- a carpentry business, where they measure blocks, use shapes and angles, and decide on the best structure that will hold up;
- a shopping mall, where they take inventory and manage payments; and
- a grocery store, where they weigh fruits and vegetables.

There are many different scenarios children can participate in, but it is important that pretend play incorporates mathematical thinking through the use of manipulatives (Parks, 2015; Worthington & Van Oers, 2016).

**Providing Adequate Time**

Teachers should set aside time during math for children to plan their play and help guide students towards mathematical play (Parks, 2015). It is then critical to provide ample time for students to position themselves in play. Children need time to explore manipulatives that promote mathematical thinking repeatedly over the course of the year. Encouraging repeated exposure to manipulatives allows students to build competencies, creativity, and also helps build perseverance (Parks, 2015). Worthington & Van Oers
(2016) stated that allowing sustained play episodes contributed to ideas being explored, developed, and sometimes revisited throughout time (p. 59). Once children have had adequate play-based learning time, children can come together to debrief by sharing their mathematical thinking and talk through problem-solving strategies with classmates (Parks, 2015).

**Entering Play**

Teachers must carefully position themselves within play-based learning interactions (Fleer, 2015). While entering play, teachers are able to either encourage mathematical thinking or hinder it depending on their relation to the situation. When teachers are positioned closely to children playing, the teacher is able to support them in a meaningful way. The teacher is observing and listening to the conversation taking place, which guides the teacher into knowing when to enter play (Fleer, 2015). Teachers are able to deepen children’s play by helping with materials and ideas (Samuelsson & Johansson, 2004). Teachers can include questioning that shifts the thinking to the students and can check understanding (Piccolo & Test, 2010). Teachers also have the capability of hindering mathematical thinking while entering play. Teachers should avoid immediately telling children how to think mathematically while solving problems. Think time is critical for children to develop reasoning and understanding. Teachers should also be mindful when setting up play; it is important for the child to take ownership in designing the play. It is necessary to understand the different positions that teachers and children take within play (Kravtsov & Kravtsova, 2010; Fleer, 2015).
Above Position. In this case, the teacher is giving the child suggestions and taking lead on how to play. There is not much choice, nor complex mathematical thinking, coming from the child in this position.

Below Position. The child takes the lead and tells the teacher how to play. In this role, the teacher is able to observe students’ thinking and understanding. This position allows for the teacher to see what additional information might help the child expand their mathematical play.

Equal Position. In this position, the teacher and child are contributing equally on play decisions. It is important to note that children’s play becomes more complex when a teacher participates equally and that the amount of play time is extended (Samuelsson & Johansson, 2004). This stage tends to let the teacher inside the children’s imaginary play and allow for higher mental functions (Fleer, 2015).

Culturally Sustaining Play

Teachers must acknowledge their understanding of high-quality practices and content knowledge to provide a welcoming learning environment for diverse groups of young students (Graue et al., 2014). Teachers are able to make play-based learning meaningful by connecting diverse cultures and mathematical experiences (Worthington & Van Oers, 2016). When students participate in a culturally sustaining experience, they also have a higher interest level in the material at hand and are able to learn more thoroughly (Bottoms et al., 2017). Children often choose to play and engage in activities that are connected to their previous experiences and the tools they are familiar with (Wallerstedt & Pramling, 2012).
A child’s background influences behavior and play. It is important that teachers working with children understand how valuable children’s culture and experiences are to enriching opportunities for culturally sustaining play (Worthington & Van Oers, 2016). Including students’ learning styles and tools from diverse cultures can promote engagement during play-based learning.

**Getting to Know Students**

Teachers need to spend time getting to know students and learning their interests and backgrounds. Teachers may choose to send home an interest survey to children and families at the beginning of the year or have children complete a survey in class. Using this information will help teachers relate new ideas in a meaningful way (Ukpokodu, 2011). Teachers can use this information for setting up play in the classroom by including pretend play centers that relate to their homelife. For example: Learning children’s favorite foods they eat at home and incorporating those items on the menu in the classroom café.

**Display Knowledge**

Students need to be able to show their learning in a way they feel most comfortable. Play allows students to show their competencies through showing rather than telling (Wallerstedt & Pramling, 2012). Being flexible with how children show their understanding allows for students to feel safe and a sense of belonging in the classroom. Examples of students displaying knowledge in various ways include the following:

- recognizing shape attributes by filling in a pattern block puzzle vs. telling the name of each shape;
• choosing the teddy bear that is the biggest vs. using specific vocabulary to label big, bigger, biggest; and
• grouping cars by size and color while playing vs. using a sorting mat to categorize buttons.

There are many scenarios children can display knowledge of their mathematical thinking. Children may feel more comfortable to show their thinking during play rather than direct assessment (Parks, 2015).

**Working with Peers**

Many minority students favor cooperative and collaborative learning styles which leads to positive learning and performance. Urban students often live in communities that are close-knit where they work and play together as family (Ukpokodu, 2011). With this being said, it is important to allow students to have the choice to work together while collaborating ideas and playing together.

**Bridging the Gap Between Home and School**

Teachers can bridge home and school learning together when sharing ideas about how to encourage play-based math in both settings. Children come to school with a variety of math knowledge but there is often a connection missing between home and school mathematical learning (Magnusson & Pramling, 2017). It is difficult to build mathematical competencies when learning happens in isolation, especially when school concepts are taught very differently than they are used in everyday settings (Worthington & Van Oers, 2016). Below are a few ideas in bridging the gap between home and school for mathematical learning.

**Cultural Practice**
When teachers take time to learn about students’ diverse backgrounds, it allows for teachers to connect home learning to the classroom. It may be helpful to send home a survey to families that will help the teacher understand how math is used in their home experiences (Worthington & Van Oers, 2016). For example: One child spends a great deal of time baking at home with their grandparent. Incorporating the idea of baking within the classroom helps that child connect their learning.

**Teachers and Parents**

Teachers can make connections with parents to understand what type of play-based learning is happening at school. This can be sent home in a newsletter, video, email, or phone conversation if needed. For example: One child may play doctor at home frequently. If parents understand that in the classroom setting children are exposed to scales, measuring tape, and thermometers to help make connections to math, parents might incorporate those tools at home for their child to build upon.

**Math Bags**

Teachers can make math bags to send home with children that include manipulatives used in the classroom. For example: A child takes home a bag with pattern blocks and families work together to build different things they can see at home. Children then come back to school and can share how they used their pattern blocks and can make connections with other children (Parks, 2015).

**Family Math Nights**

By hosting a Family Math Night at school, families are able to join in on the mathematical learning that takes place in the classroom. Families are able to transfer this information to their home learning. This type of event also allows teachers to gain
understanding of children’s mathematical experiences they have at home and allow for families and teachers to work together (Bottoms et al., 2107).

**Discussion**

**Conclusion**

Incorporating play-based learning in an early childhood mathematics classroom heavily involves the teacher’s participation. It is vital that teachers are on board with this idea in order to fully implement it successfully. Children come to school with a background of mathematical knowledge. Incorporating play-based learning allows for children to bring prior mathematical knowledge and bridge it together with new learning through meaningful ways. It is important for teachers and parents to work together to help students be successful in their learning and to obtain a greater understanding of cultural identities within the classroom. By incorporating cultural identities within play-based mathematics, students are able to authentically learn mathematical knowledge.

**Limitations**

There is a sufficient amount of research readily available for play-based learning in a preschool setting. There seems to be an opportunity for more research within play-based learning in an elementary setting, especially beyond kindergarten. Play is often found as a break from learning and does not typically align with content being taught within the classroom (Wallerstedt & Pramling, 2012). As students surpass kindergarten, play is often found in the form of games, such as board games and technological applications, to increase engagement (Cohrssen & Niklas, 2019; Siew, 2018). Technological applications used in the classroom often result in children practicing facts
and may not encourage conceptual understanding and mathematical conversation with peers.

**Future Directions**

Learning math in the early childhood classroom is present in many different forms, but studies show that play-based learning in math allows children to use new concepts learned in the classroom and to connect them to the world around them through play. Incorporating science, technology, engineering, and mathematics (STEM) within the classroom is a direction for teachers to encourage play and inquiry-based learning beyond the early childhood classroom. STEM encourages students to solve real world problems by applying learned mathematical concepts and understanding the importance of concepts being taught. This type of inquiry-based learning encourages hands-on learning and can be age-appropriate play for students as they move beyond the early childhood classroom (Hill-Cunningham, 2018).

Play is being displaced during learning and teachers are crucial in saving play in the classroom (Wallerstedt & Pramling, 2012). Teachers can use their learning to understand the role that the teacher plays in play-based learning in the early childhood mathematics classroom. It is important that teachers are able to make math meaningful by connecting with children and tying in student interest and diverse backgrounds. There are many ways for the teacher to set up play, such as including easily accessible math manipulatives and allowing adequate time for children to explore. Teaching children new concepts and allowing time for play-based learning through blocks, puzzles, object collections, sensory tables, measuring tools, Play-Doh, and pretend play will allow children to make connections to the world. It is important to be mindful of creating a
culturally sustaining experience for children to connect their home and school learning of mathematics.
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https://doi.org/10.1080/10901027.2014.968296


https://cornerstone.lib.mnsu.edu/icitl/vol2/iss1/2


Using Anti-Racist Education to Diminish Educational Debt

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Proper APA Citation for this Article is:
Abstract

Bringing in student culture, ethnicity, and backgrounds into the classroom can be beneficial for all learners (Gay, 2013). Anthropologists have been urging schools to insert culture into education instead of education into culture for decades (Ladson-Billings, 2006). Yet, our country is more divided than ever. There continue to be dramatic gaps in performance between White students and Black Indigenous People of Color students. Therefore, schools must push past multicultural education and the notion of integrating culture into schools and instead commit to implementing anti-racist education. There are three common goals of anti-racist education: (a) identifying or making visible systematic oppression; (b) challenging denial of complicity in such oppression; and (c) transforming structural inequalities. The adoption of an anti-racist education through the implementation of these goals is the only way that schools will start closing the opportunity gaps that have been plaguing our schools for decades. The steps necessary for educators and schools to achieve these goals are described in this paper.

Keywords: Anti-racist education, Educational debts, Multi-Cultural Education.
The Importance of Implementing Anti-Racist Education

Social movements erupted around the world after the killing of another unarmed Black man, George Floyd, perhaps because the effects of systematic racism in the United States have now become more apparent than ever to many. As protests explode around the country, the disparities in healthcare, opportunities, wealth, and education can no longer be ignored (Ladson-Billings, 2006).

In an effort to address the racial disparities that have long been a part of the education system, the term “achievement gap” must be analyzed and reconsidered. The term achievement gap has been a widely used buzzword in education for decades and many educators use the term without question. However, there are many problems behind the term (Ladson-Billings, 2006). The data shows that Black, Indigenous, and people of color (BIPOC) are continuously underperforming on standardized tests compared to White students. Referencing this disparity as an achievement gap, however, it also suggests that BIPOC are not doing their part in terms of their education. This terminology is often used to place blame on children and their parents. In contrast, the term “educational debt” encourages us to stop placing blame on students and to start looking at and working toward closing the funding gap (Ladson-Billings, 2007). For example, schools in the suburbs, that often serve predominantly White students, receive more funding than urban schools that often serve predominantly BIPOC students. Urban schools in Chicago (87% BIPOC students), Philadelphia (79% BIPOC students), and New York City (72% BIPOC students) receive ~$10,000 less per student than suburban schools (Kozol, 2005). That is, U.S. schools are disproportionally funded that serve predominantly White students. This unequal funding has resulted in unequal materials and opportunities for White children and fewer opportunities for BIPOC children.
The inequitable opportunities for BIPOC children cannot simply be fixed with more funding. For decades, schools have been seeing influxes in their population of BIPOC students. Currently, BIPOC students make up approximately half of the student population (Ahmad & Boser, 2014). While the number of BIPOC students continue to rise, 80% of the teachers in the United States are White (Ahmad & Boser, 2014), which can cause a disconnect between students and teachers.

One cause for this disconnect is the concept of Whiteness. Whiteness is the idea that the self-awareness of White people is often limited by a blind spot around the meaning and impact of being White in a multiracial society (Altman & N. Altman 2013). In the United States, these blind spots can lead to negative outcomes in the classroom. Teachers having different backgrounds than the students they are teaching, can present many challenges (Utt & Tochluk, 2016). Many teachers do not recognize the assets that BIPOC students bring into the classroom. Teachers often view racial and cultural differences as breaking White cultural norms and see them as students’ weakness. Since White teachers often view student behavior from a lens of Whiteness an overrepresentation of BIPOC children are disproportionately referred to special needs programs and are underrepresented in gifted programs (Howard, 2003). In order to seek change, educators must be willing to change a system that is disadvantaging, marginalizing, and oppressing BIPOC students. Therefore, the purpose of this paper is to review anti-racist teaching methods that could help to diminish the educational debt that has accrued.

**Review of Literature**

Anti-racist education is that of a deliberately politicized pedagogical approach, concerned with confronting systemic and structural oppression (Lynch, Swartz, & Isaacs, 2017).
This topic has been widely researched in the US, UK, and Canada with a focus primarily on higher education. After closely reviewing this research, Lynch, Swartz, & Isaacs (2017) identify three common goals of anti-racist education: (a) identifying or making visible systematic oppression; (b) challenging denial of complicity in such oppression; and (c) transforming structural inequalities.

Research has also identified many different challenges schools faced when trying to implement an anti-racist education. One of the biggest challenges identified is getting both staff and students to recognize and accept that systemic racism does exist. Drawing attention to systemic racism is often met with resistance by both White students and White teachers with selective perceptions of reality, guilt, and anger (Lynch, Swartz, & Isaacs 2017). Implementing anti-racist education does not have an end goal of making White teacher or students feel guilty about their privilege. Anti-racist education provides strategies to engage students and teachers to initiate conversations that face racism and privilege head on (Case & Hemmings, 2005).

Another major challenge when implementing anti-racist education is the drastic need for changes in teacher preparation programs. Many teacher preparation programs currently only require one diversity class making it extremely difficult to adequately prepare educators for the variety of diversity they will face in the classroom (Shim, 2018). Anti-racist education not only calls for more classes, but also more teacher self-reflection. These teacher preparation programs can help future educators develop a positive, anti-racist White racial identity which in turn will help them implement more effective, culturally responsive and anti-racist teaching practices to bring into their classrooms (Utt & Tochluk 2016). It is also important for future educators to have a better understanding of what practices have and have not worked in the past. Teachers
need to be able to distinguish anti-racist from two other approaches -the assimilation or color-blindness in race, and multiculturalism (Vandeyar, 2010).

Previous Approaches

<table>
<thead>
<tr>
<th>Anti-Racist Approach</th>
<th>Multicultural Approach</th>
<th>Culturally Responsive Approach</th>
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<tr>
<td>•Identifies or makes systematic oppression visible.</td>
<td>•Creates equal learning opportunities for all students no matter their gender identity, sexual orientation, socio-economic status, or racial ethnic, language and cultural groups.</td>
<td>•Recognizes and celebrates diversity.</td>
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<tr>
<td>•Challenges the denial of complicity in such oppression.</td>
<td>•Encourages teacher self-reflection to diminish racism in schools.</td>
<td>•Develops a closer fit between home and experiences in education.</td>
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There have been many educators who have tried to implement different types of pedagogy to confront and disrupt racism. Culturally congruent, culturally responsive, and culturally compatible curricula have all been different labels used to encourage teachers to develop a closer fit between students’ home lives and experiences and their education (Ladson-Billings, 2006). There have been some benefits from these approaches. Research suggests that students feel more valued and capable of learning when they are in a learning environment where the teacher is responsive to their needs, yet the outcomes of these methods have been less than optimal (Lim, Tan, & Saito, 2019). Many of these efforts have been criticized as being implemented at a superficial level with recognitions of holidays and the celebrations of ethnic foods (Abacioglu, C.S., Volman, & Fisheer, 2019). While recognizing culture may be an
important step in creating a more inclusive learning environment, it does not fight to change systemic racism and close the education debt.

Superficial inclusive practices can also lead to other issues in schools, color blindness, or the complete denial of racism in schools (Lim, Tan, & Saito, 2019). Colorblindness, in other words not seeing their students’ racial identities and ignoring the constructs of race and being unaware of how it shapes their own teaching practices (Utt & Tochluk, 2016). In a study on racialization, Rebecca Raby (2004) interviewed twelve White girls about the existence of White privilege and racism in schools. The common theme across interviews was a perception of being anti-racist, yet they still talked about race, joked about race, and downplayed the existence of racism in schools (Raby, 2004). While these girls recognized racism and claimed to understand racism, they did not realize that their actions were racist. Thus, showing that the denial of racism approach does not work to eliminate racist behaviors in schools. Many people have the misconception that unless someone is being actively racist, then racism did not occur. Our students need to be taught that racism exists, and it exists in many forms.

White educators are also complicit in the denial of racism in schools today. Many White educators claim to be colorblind. However, when educators maintain a colorblind ideology, it often leads to a disconnect between BIPOC students and their teachers. Many BIPOC students become bored and lose interest in school because the material does not relate to their own past experiences and they cannot connect to the content (Sleeter, 2016). Other White educators avoid race talk altogether because they believe that their schools and their students are colorblind. In interviews with educators, Raby (2004), found that efforts to not be racist or ‘race blind’ stemmed from their experiences with multicultural education, which demonstrates the prevalence that this approach has had on U.S. schools.
Multicultural education evolved in the early 1970’s and is defined as an educational reform movement whose major goal is to change the structure of educational institutions so that students of all gender identities and sexual orientations, exceptional students, and students who are members of marginalized racial ethnic, language and cultural group have an equal chance to achieve academically in school (Banks & McGee Banks, 2010). A multicultural approach to education encourages teachers to create classroom environments that promote critical cultural consciousness, cultural self-awareness, and the development of multicultural communication that are beneficial for both teachers and students (Gay & Howard, 2000). Multicultural education calls on teachers to create a strong sense of cultural consciousness to reach all students but also requires teachers to self-reflect. When beginning the reflection process, teachers should ask themselves: Am I recognizing the different backgrounds, ethnic groups, and cultures in their classroom? Am I letting my own background limit my teaching techniques? Am I bringing in multicultural pedagogical knowledge and skills (Gay & Howard, 2000)? Getting educators to be culturally consciousness, provide cultural therapy, and utilize multicultural pedagogical knowledge are essential starting points in reducing educational debt. However, these things alone will not transform our education system.

There is an overwhelming number of critiques that suggest that multicultural education has failed to deliver results. Schools cannot just recognize events on calendars, bring in cultural performers and hold school assemblies and think that educational gaps will be fixed (McCreary, 2009). Teachers and students do not interrogate systems of racial power by simply recognizing diversity. White students continue to outperform on measures of achievement, perhaps because educators continue to use problematic educational practices and assessments. If educators want to start making real gains, teachers need to do more than just bring culture into the classroom.
Educators need to start facing racism head on, because “school is not a racially neutral site; we need to unravel the power of Whiteness and how it is reproduced in the classroom” (McCreary, 2009, p. 1). Therefore, educators must take on anti-racist approach to education in order to pay back educational debt.

**Anti-Racist Education**

In an effort to reduce the educational debt, an alternative to multicultural education is to supplement or replace multicultural education with the approach of anti-racist education. Lynch, Swartz, & Isaacs (2017) describe these efforts as going beyond educational reform and to transform the structural racism inequities of today. Hassouneh (2006) describes anti-racist education as a whole school commitment that deconstructs the social construction of race and analyzes the interlocking systems of oppression.

Although both multicultural and anti-racist education share the same goal of transforming oppressive systems, the methodology behind each is very different. Multicultural education encourages schools to recognize and celebrate diversity. In contrast, “an anti-racist education calls for a whole school approach that includes instructional materials and strategies; teachers’ expectations, attitudes and behavior; language issues; staff composition; racial incident policies; parental involvement; and staff development” (Lynch, Swartz, & Isaacs, 2017, p.131). Anti-racist education calls upon all students, staff, and community to act and work together to make differences in our schools.

Boyd and Arnold (2000) argue that, unlike multicultural education, anti-racist education proponents do not limit their focus to simply attitudes that individuals may have toward other individuals based on commonalities or differences. Instead, anti-racist education encourages
educators to look beneath such attitudes to examine the systemic, structural components of racism and oppression in schools.

Anti-racist education goes beyond the facets of multicultural education of simply “bringing” or acknowledging more culture and diversity into the classroom. Anti-racist education demands action. The best way for schools to act is to implement the three common goals of anti-racist: (a) identifying or making visible systematic oppression; (b) challenging denial of complicity in such oppression; and (c) transforming structural inequalities. (Lynch, Swartz, & Isaacs, 2017)

Anti-racist education calls for teachers to self-reflect on how their own past experiences, including White privilege, impacts their teaching methods and practices. Getting teachers to understand these differences and privileges can be one of the most difficult challenges when trying to implement an anti-racist education. Very few White teachers come from their students’ urban communities and fully understand the racialized socio-economic factors and systemic racism that their students face (Howard & Milner, 2014).

Yet, schools will not change unless teachers are willing to have the conversations with students about systemic racism that is rampant in schools. Once teachers are ready to have those conversations, students and teachers can go beyond the notion of bringing in more culture to our classrooms, and they can start working together to achieve the three common goals of an anti-racist education.

Implementing Anti-Racist Education

In order for schools to act and successfully implement anti-racist education, administration, staff, parents, and students must work together to achieve the three common goals of anti-racist education: making visible systematic oppression, challenging denial or
complicity in such oppression, and transforming structural inequalities (Lynch, Swartz, & Isaacs, 2017). The first step in adopting an anti-racism education involves recognizing racism as an institutionalized system that is unequally designed to benefit White people (Utt & Tochluk, 2016). Anti-racist education must challenge the denial of complicity in oppression as well as the colorblind approach that promotes a denial of the existence of oppression. This goal requires teachers to recognize and face the existence of the oppression so they can start the transformation process.

Using an anti-racist framework requires educators to analyze widespread racism and White supremacy evident across texts, schools, and society (Neville, 2020). Teachers have a responsibility to transform structural inequalities. Once teachers have accepted that racial inequality in school exists, they can begin the structural change within the staff, students, and community. Boyd and Arnold (2000) argue that an anti-racist education must critically examine the systemic, structural features that organize life prospects oppressing some while privileging others.

**Identifying or Making Visible Systematic Oppression**

The first step to moving toward anti-racist education is for White teachers to become more aware of how to teach to students that are different than themselves, which requires a deep understanding of themselves first. Often White people do not recognize the invisibility of being “White”. White teachers assume that Whiteness is an assumed neutral for teaching, and that is often not the case. Teachers are unaware how they rely on their own past experiences to shape their teaching methods (Milner, 2006). When White teachers do this, it makes it difficult for students from different racial identities to connect with material. Research documents profound negative consequences of having a primarily White teaching force with little understanding of
race and racism (Utt & Tochluk, 2016). Latino students have a dropout rate near 30% over the last three decades. African American and Latino students comprise the largest ethnic minority groups in U.S. Schools. However, both groups lag behind grade level competence in core subject areas (Howard, 2003). The racial and cultural incongruence between students and teachers often explains school failure for BIPOC students. Teachers have to be better prepared to teach students from different cultural and racial backgrounds. The most sensible place to begin this process is to start with teacher preparation programs.

Teacher Preparation

Anti-racist education calls for better teacher preparation programs that challenge the White privilege that many of our teachers do not fully recognize (Shim, 2018). Currently many teacher preparation programs only require one course on diversity, if any. It is impossible for teacher candidates to develop the adequate cultural competence necessary in one course. Developing the knowledge of systems of oppressions, White privilege, and inequity are a process that takes a lot of time and a lot of self-reflection (Utt & Tochluk 2016). Racism shows up in unique ways in every-content area, making it important for antiracism to be embedded into every content area teacher prep course. When teacher candidates take multiple courses on diversity they can develop culture competence.

Teacher preparation programs should start reevaluating how much time teacher candidates spend in a university classroom and how much time they spend in an actual classroom with an expert teacher (Clark, Zygmunt, & Howard, 2016). The first step in this process it to make sure that universities are getting the most committed, self-reflective antiracist teachers to mentor teacher candidates. Spending more time and the field with expert antiracist mentor teachers can allow for more time to see how all of the theories and practices can come together and can be
applied to create culturally competent classroom. Culture competence includes knowing and understanding the way in which culture shapes and influences how people think, learn, and communicate (Clark, et al., 2016). Placing teacher candidates with the most qualified teachers along with placing them in diverse classrooms in their training will help them reflect on their own cultural competence (Howard & Milner 2014). Getting teacher candidates to develop culture competence will not only help teacher candidates to grasp a better understanding of culture, but also figure out the best approaches to teach all students of all cultures. Teacher preparation programs must offer knowledge, skills, and tools for learning about cultural and racial diversity (Shim, 2018).

Teacher Acceptance

Another step in making systematic oppression visible is for White teachers to accept the demographic divide (Gay & Howard, 2003) that is occurring across the United States. Teachers need to face the reality that their contact with BIPOC is only going to grow. The U.S. Department of Commerce 1996 projects that by the year 2050, BIPOC will comprise over 57% of all U.S. students (Howard, 2003). Once White teachers face this realization, they will need to begin self-reflecting on how their educational experiences and needs differ from those of their students (Howard, 2003). It is critical for teachers to recognize how issues such as race, ethnicity, and culture shape the learning experiences for many students. Teachers must then be willing to construct pedagogical practices that have relevance and meaning to students’ social and cultural realities (Howard, 2003). This does not mean that White teachers need to feel guilty about something they have been socialized into, but they do need to take responsibility for learning about how to interrupt the current inequitable system and develop teaching practices that are beneficial to all students (DiAngelo, 2016).
White teachers need to realize and recognize the advantages that they have been given. This process takes both time and the willingness to admit that racism exists (Utt & Tochluk, 2016). Once teachers have developed a positive anti-racist identity, teachers can start to get comfortable with the uncomfortable and begin to talk about racism. Even in the absence of racial diversity, teachers need to understand and teach their students that racism is always operating (DiAngelo, 2016). Teachers need to be ready to be have open and honest conversations about racism in their classroom.

**Challenging Denial or Complicity in Such Oppression**

The second step in developing as an anti-racist educator is to challenge one’s complicity in the oppression. In order to do this, educators must understand the stark difference between being racist and anti-racist. A racist is someone who is supporting a racist policy by their actions or inaction or expressing a racist idea. In contrast, an antiracist is someone who is supporting an antiracist policy by their actions or expressing an antiracist idea (Kendi, 2020). It is also important for educators to understand that this is an ongoing process. “These terms are like peelable name tags that can be placed and replaced based on what someone is or is not doing, supporting or expressing in each moment. These are not permanent tattoos (Kendi, p.23, 2020). Educators must realize that even though they may have supported a racist policy or action in the past, it does not mean they are forever racist. Likewise, just because they may have expressed an anti-racist action or idea, it does not mean they are permanently anti-racist.

Shim (2018) also challenges teachers to explore the invisibility of Whiteness and deconstruct how White racial supremacy affects their teaching. Once teachers have gained a clear understanding of racist vs anti-racist and have self-reflected and recognized White privilege, it is time to get their students to take on the same process. Again, this action must go
beyond the facets of multicultural education of just bringing more culture in to the classroom. Here are some basic starting points to discuss with students:

- All members of this society have been socialized to participate in it.
- Racism exists today, in both traditional and modern forms.
- All white people benefit from racism, regardless of intentions.
- Our racial socialization occurred without consent and doesn’t make us bad people.
- We have to take responsibility for racism (DiAngelo, 2016).

It is important for students to understand that whether or not racism is intentional or unintentional, it does exist, and it exists in different forms. There are four main types of racism. Active racism is the deliberate act of telling or encouraging racist jokes. Active racism could be the methodical exclusion or discrimination against people of color and also includes acts such as racial profiling or accusing people of color of “playing the card” when they try to call attention to racism (DiAngelo, 2016).

Passive racism is the silent ignoring of incidents that are well noticed. Examples could include inequitable funding of schools or having a lack of interest in learning more about racism and how to stop racism. Passive racism would also include having very few cross-racial relationships or not becoming involved in anti-racist efforts or continuing education (DiAngelo, 2016). Other common examples of passive racism in schools are participating or not speaking up against racist stereotypes or jokes. Many students deny that racism exists yet unknowingly complied in racist behavior (Raby, 2004).

Active antiracism separates thoughts and actions and declares a personal goal to begin the process of dismantling racism (Mosely, 2010). Dismantling racism begins with the process of identifying internalized racial dominance if you are White. If you are a person of color, active
anti-racism means working to identify internalized racial oppressions. Other examples of active antiracism are making sure that there are multiple racial perspectives in the workplace, joining organizations for racial justice, and seeking continuing education (DiAngelo, 2016).

Trepangnier (2017) suggests that passive anti-racism requires taking a committed stand against racism. A stand that then transforms into action and disrupts racism in its various forms. Antiracism must be active by its definition. It is impossible to be anti-racist if one does not take action against racism (DiAngelo, 2016). This type of passive anti-racism is currently pervading society (Mosely, 2010).

Once teachers understand the different types of racism prevalent today, they are ready for one of the most important parts of antiracist education: setting an example for their students. This is not an idea that is going to be mastered in a short time. It is a process and modeling the process and being open and honest with your students is imperative. It is important for teachers to:

- Take responsibility for our mistakes.
- Attend trainings on antiracism.
- Engage in activities that will expose you to different racial views.
- Read research and scholarship on race, racism, and whiteness.
- Develop and model genuine, long-term, trusting relationships with people of color.
- Think in terms of structures and patterns, not individual people and acts (DiAngelo, 2016).

**Transforming Structural Inequalities**

The third and final goal in achieving anti-racist education is the actual transforming of inequalities within the educational system. For example, teacher preparation programs should
ensure that they are not only sending qualified teachers into the field, but that they are mentored by the best and brightest antiracist teachers (Clark, Zygmunt, & Howard, 2016), because adequately preparing pre-service teachers before they step into the classroom is key in successfully implementing anti-racist education.

Next, teachers need to take a serious look at the curriculum they are using in their classrooms. Anti-racist education does not simply bring in books with diverse characters for students; it uses curriculum that challenges the way students view society (Neville, 2000). Does the curriculum address White privilege? Does curriculum cite the ongoing violence of colonialism that has shaped school and society (McCreary, 2009)?

Another item to consider when addressing curriculum is to look at the standards. Learningforjustice.org offers Social Justice Standards that serve as a road map for anti-bias education at every grade level. There are four different anchor standards and domains to help instruct teachers: identity; diversity; justice; and action. The anchor standards under identity and diversity mainly call for students to recognize and accept diversity, similar to that in multicultural education. However, the anchor standards under justice and action demand action from students to change the structural inequalities present in school systems today. Paralleling the idea that teachers not only need to do this work themselves but also help guide students in their own journey in anti-racist education. Including these standards allows educators to engage in a range of anti-bias, multicultural, and social justice issues with their students. (Learning for Justice, 2020).

Another way to change these inequalities if for teachers to examine their expectations of all students. Teachers sometimes base their expectations for student achievement on student
ethnicity. Often, teachers provide higher quality instruction to students from whom they expect more (McKown & Weinstein, 2008). Often times educators make excuses for BIPOC students:

- The parents just do not care.
- These children do not have enough exposure/experiences.
- These children are not ready for school.
- Their families do not value education.
- They are coming from a “culture of poverty” (Ladson-Billings, 2007).

Teacher expectations are strongly linked to student achievement (McKown & Weinstein, 2008). While teachers often think they are doing students a favor by making exceptions or holding BIPOC to lesser standards than their peers, they are only contributing to the educational debt (Ladson-Billings, 2007). All students need to be held to the same standards regardless of their situation.

Finally, and perhaps the most complex, is to address the funding gap and get our nation to start funding our schools equitably. “In its report entitled The Funding Gap, 2005, The Education Trust states that “In 27 of the 49 states studied, the highest-poverty school districts receive fewer resources than the lowest-poverty districts…Even more states shortchange their highest minority districts. In 30 states, high minority districts receive less money for each child than low minority districts.” (Ladson-Billings, 2006, p. 9) We can never expect BIPOC students to “catch-up” when the starting line is not even remotely in the same ball park. Schools that are underperforming and falling behind need help from the government; they should not be punished and lose out on more funding.
Discussion

Overall, it is evident that after decades of trying to close the educational gap, schools are still failing BIPOC students. It is time that all schools begin implementing anti-racist education. Anti-racist education is a process that requires dedication from school systems, teachers, and students. Once there is acknowledgement of the complicity of all, educators can go beyond raising awareness of the systematic racism plaguing are schools and act to achieve the three main goals of adopting an anti-racist education.

The first goal of identifying and making visible systematic oppression relies heavily on teachers. Teachers need to begin the self-reflection process and recognize how their race and culture have benefited them and impacted their teaching methods. Teacher preparation programs must adequately prepare White teachers to teach BIPOC students by helping build cultural competence. Once teachers are more adequately prepared to teach BIPOC students, they can start recognizing and challenging the racism that surrounds schools today. When teachers have a clear understanding of what racism is and how it shapes our everyday lives, they can begin to have conversations with students about racism.

Challenging denial of complicity in such oppression requires teachers to call out to students the different types of racism that are prevalent in society today: Passive racism, active racism, passive anti-racism, and active anti-racism. Getting students to understand that racism still exists today and getting them to challenge their complicity in racism is the second goal of adopting an anti-racist education. To help students achieve this goal teachers can admit their mistakes, role model cross cultural relationships, attend conferences and trainings on antiracist education.
Finally, teachers and students can work together to start changing the structural inequalities that our schools are facing. Teachers should change the curriculum they are using to not only make sure it includes diversity, but that it also challenges the ways students think and act. Schools can look at their staffing to ensure that they have the most culturally competent teachers teaching their students. The most difficult, is to get our nation to start recognizing and fixing the funding gap so that all schools have an equal playing field.

It is evident that years of negligence has led to an educational debt to BIPOC that must be paid back now. Teachers, students, and schools need to stop brushing over topics of race, culture, and diversity and face them head on through the use of antiracist education.

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doi:10.1177/0042085916648741

doi:10.15700/saje.v30n3a359
Using Outdoor Learning as an Instructional Strategy

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Mary Schoeb grew up in Minneapolis, Minnesota and although she attended the University of Minnesota right out of high school, it was not until she returned to school later in life to graduate from Western Governors University with her degree in Elementary Education in December 2017. Mary was lucky enough to find a position teaching 4th grade at the School of Engineering and Arts (SEA), a S.T.E.A.M. magnet school in the Robbinsdale Area School District in Minnesota. She lives close to school with her husband and two young sons. She recently completed her Master’s degree in Elementary Education, with an emphasis in Science, Technology, Engineering, and Math (S.T.E.M.) from Minnesota State University, Mankato. When Mary is not teaching or wrangling her energetic children, she is either reading or spending time outdoors. She is grateful for the incredible knowledge she has gained while at Mankato. Mary is dedicated to creating a space where student voices are amplified, and social justice ideals are integrated into the culture of the class. She is excited to take her passion and knowledge to create learning opportunities that further engage and inspire her students.

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Proper APA Citation for this Article is:
Abstract

Spending time in nature or an outdoor environment is a healthy practice that can provide many mental and physical benefits. Thus, outdoor learning is an instructional strategy that can capitalize on these benefits and that is engaging for students. Outdoor learning can encourage student engagement in the content, while offering authentic learning opportunities. Outdoor learning can positively impact students’ learning and intrinsic motivation, their social and behavioral needs, as well as improve their problem-solving and critical thinking skills. Teachers may face a variety of potential barriers when attempting to facilitate outdoor learning. These obstacles are described and addressed by providing strategies for teachers to promote and integrate outdoor learning into their instructional practice. Developing and nurturing a school culture that encourages outdoor learning experiences is discussed.

Keywords: outdoor learning, experiential learning, nature-based learning
Using Outdoor Learning as an Instructional Strategy

Imagine falling snow in the middle of the winter season. The excitement is barely contained as students prepare for the upcoming lesson outside. In their mittened hands, they carry a magnifying glass and a field guide for snowflake identification. As the students step outside, their learning environment transforms immediately, and the excitement is hushed as the snow blankets the ground. They work collaboratively in small groups to catch the falling flakes and to identify them using scientific vocabulary and their knowledge of weather conditions. Students only just left the front doors of the school, when they stepped into an entirely different classroom. This is what outdoor learning looks like.

Outdoor learning provides a way for students to connect directly to the environment around them and to the natural world (Carrier et al., 2013; Coyle, 2010; Louv, 2008). Many teachers believe that “nature is important to elementary-age child development, such as fostering feelings of stewardship, learning from nature, and increasing calmness and relaxation” (Shume & Blatt, 2019, p. 1,363). Exposure to nature-based activities like school gardens, nature walks, and general nature-based curricula affect the learner because the learner often experiences more engagement and increased movement (Kuo et al., 2019; Shume & Blatt, 2019). Learning in a nature-based or outdoor setting allows for increased autonomy, fresh air, social interactions, collaboration, and less human-made white noise (Kuo et al., 2019). Engaging students in an outdoor learning setting, teachers can significantly impact social, behavioral, and academic outcomes, including increased retention across all content areas; increased critical thinking and problem solving; increased connection to nature and understanding human effects on nature; and an increased desire to positively impact the environment (Kuo et al., 2019; Louv, 2008; Shume & Blatt, 2019).
Engaging students in experiential learning can give them the opportunity to play an active, rather than passive, role in their own education. This type of learning often results in a greater understanding and retention of content because it helps the students connect the learning to concrete and real-life situations (Farnham & Mutrie, 1997; Kolb & Kolb, 2018; Louv, 2008). Outdoor learning methods embody the experiential learning approach and provide significant benefits for student cognitive skills and social and behavioral needs (Ernst & Monroe, 2004; James & Williams, 2017; Jose et al., 2017; Khan et al., 2010; Piaget, 1964/2003).

Outdoor learning is student-centered, inquiry-based learning (Ernst & Monroe, 2004). This correlates to Piaget’s (1964/2003) assertion that learning occurs when participants are the active subjects engaged in authentic learning contexts. When students are active learners, they often take more initiative in solving problems and increase thinking creatively about alternate solutions (Piaget, 1964/2003). These are life and career skills that are often deemed necessary for student success (American Association of Colleges for Teacher Education, 2010). Mirra and Garcia (2020) claim that modern students require an educational setting that focuses on interest-driven content, production-centered assessment, and integrating multimodal communications. An outdoor, hands-on, experiential learning environment can support these skills and educational concepts, because it engages students’ critical thinking and problem-solving skills and develops their disposition towards metacognition strategies (American Association of Colleges for Teacher Education, 2010; Ernst & Monroe, 2004; Louv 2008). Using outdoor learning as an instructional approach can have a positive impact on students’ cognitive domain, can support their social-emotional needs, and can increase motivation (Ernst & Monroe, 2004; Louv 2008). Therefore, the purpose of this paper is to explain the importance of outdoor learning in education and to provide strategies for teachers to integrate it into their practice.
Benefits and Barriers to Outdoor Learning

Nature-based learning gives students the opportunity to be an active learner in an authentic environment and it can give students deeper understanding and meaning (Fägerstam & Blom, 2013; Jørgensen, 2017; Montero, 2018). Benefits and potential barriers to outdoor learning exist and should be addressed before implementing as an instructional strategy.

Benefits

Teachers use a variety of instructional approaches in their practice. They strive to adhere to standards and rigorous standardized tests and it is critical that those educational approaches are effective (Ernst & Monroe, 2004). The following section focuses on the specific ways that outdoor learning is a valuable approach.

Cognitive Impact

Critical thinking and problem-solving skills are necessary components of instruction (NEA, n.d.). The National Education Association (n.d.) defines critical thinking as the ability to reason effectively, to analyze cause and effect of events, to make connections and interpret all available information to make sound decisions, and to solve problems by asking questions and identifying possible solutions. Ernst and Monroe (2004) draw parallel conclusions for cognitive skills at the core of outdoor learning: interpretation, analysis, evaluation, and explanation. Students who are actively engaged in repeated outdoor learning increase these skills, along with problem-based and inquiry-based learning (Ernst & Monroe, 2004; Montero et al., 2018; Rios & Brewer, 2014).

Students demonstrate critical thinking and problem-solving skills through their participation in outdoor learning tasks. For example, a group of students studied the water quality of a local river. They compared their data with other rivers and investigated their findings (Ernst
& Monroe, 2004). This type of inquiry encourages students to question what they are experiencing and to explore different possible answers (Ernst & Monroe, 2004; Fägerstam & Blom, 2013; James & Williams, 2017).

Students can make meaning of the content by interpreting and analyzing observations and findings in an authentic setting (Ernst & Monroe, 2004). One example of this is comparing environmental themes and how they affect an ecosystem (Jose et al., 2017). The hands-on context of outdoor learning provides increased opportunities for retaining the content (Fägerstam & Blom, 2013; James & Williams, 2017) and applying the content knowledge to new understanding and analysis (Becker et al., 2017).

**Social & Behavioral Needs**

Some students, particularly those with special needs, often have difficulty in a traditional classroom and struggle with social interactions (Farnham & Mutrie, 1997; Price 2019; Szczytko et al., 2018). Outdoor learning can increase student collaboration with their peers, engagement in group discussion, and willingness to ask questions publicly (Farnham & Mutrie, 1997; Price, 2019; Szczytko et al., 2018). When outdoor experiences continue regularly, relationships, self-management, and social awareness also increase (Becker et al., 2017; Jørgensen, 2017). Students are likely to develop more collaborative relationships with their peers (Khan et al., 2019; Montero et al., 2018; Price, 2019). Whereas, when they are in the classroom, they are more likely to work alone or seek to disrupt others (Khan et al., 2019).

**Increasing Motivation**

Teachers are continuously seeking ways to help motivate students in their learning. Intrinsic motivation, or motivation that is a result of internal factors, is shown to increase when simply being surrounded by nature (Becker et al., 2017; Kuo et al., 2019). Therefore, it would
make sense for teachers to engage their students in outdoor lessons whenever they have the opportunity. An example of this is evident in the results of a gardening study where surveyed students described their own motivation before and during outdoor activities (Cameron & McGue, 2019). The students discussed how the setting alone helped motivate them to want to work harder than they normally do in the classroom (Cameron & McGue, 2019). When directly engaged in the experiential context of outdoor learning, students exhibit more on-task behavior and demonstrate an increase in their desire to participate and learn (Price, 2019; Szczytko et al., 2018). Their active involvement can result in increased attention and a decrease in disruptive behavior (Price, 2019; Szczytko et al., 2018). These outcomes can affirm the efficacy of outdoor education practices for students who find the conventional classroom setting and learning methods challenging and unmotivating.

Potential Barriers

When teachers consider the benefits and address the potential obstacles to an outdoor classroom setting, they can begin to incorporate this instructional method into their practice. The breadth and scope of outdoor learning can be daunting to educators (Khan et al., 2019; Rios & Brewer, 2014). Teachers may encounter several barriers prior to using this strategy: a fixed teacher mindset as it relates to outdoor learning, the time, space, and money associated with conducting lessons outdoors, and possible unfavorable weather conditions.

Teacher Mindset

The research describes teacher confidence as one element that prevents educators from engaging in outdoor learning (Rieckenberg, 2014; Scott et al., 2015). Because outdoor learning facilitates more authentic experiences, students will likely face different challenges than they may typically face in the traditional classroom (Szczytko et al., 2018). A teacher’s mindset is
critical to providing outdoor learning because their attitude towards the instructional method will affect how a student embraces the experience (Carrier et al., 2013; Rios & Brewer, 2014). Teacher confidence or comfort in outdoor learning instruction, based on their lack of knowledge of the content or methods of delivery, can be significant barriers (Carrier et al., 2013; Scott et al., 2015). When teachers do not have the knowledge of how to implement outdoor learning into their practice, they can be hesitant to try it or to change their attitude towards it (Carrier et al., 2013; Rios & Brewer, 2014; Scott et al., 2015).

**Time, Space, and Money**

Even with a mindset that embraces the nuances of experiential learning, teachers identified concerns, such as time, space, or funding, as barriers to outdoor learning (Rieckenberg, 2014; Scott et al., 2015; Shume & Blatt, 2019). Additional obstacles could be resistance from administration, either in the building or district, and the expectations of adhering to mandated curriculum (Carrier, et al., 2013; Rios & Brewer, 2014; Scott et al., 2015; Shume & Blatt, 2019). This could be considered a direct reflection of the school climate and how the school culture promotes experiential learning (Scott et al., 2015).

Many teachers believe it is more efficient and cost-effective to conduct lessons in the classroom (Carrier et al., 2013; Scott et al., 2015; Shume & Blatt, 2019). The time and associated costs to modify the outdoor learning environment or transport to a new location is often considered to be too great a burden (Carrier et al., 2013; Scott et al., 2015). Planning time is another potential barrier; outdoor lessons must be thoughtfully planned and aligned to standards (Carrier et al., 2013; Shume & Blatt, 2019). For example, teachers planning an outdoor lesson for the first time will need to take time to ensure it meets the needs of the learners and then take additional time to reflect and adapt the lesson for future use.
Unfavorable Weather Conditions

Another potential barrier for teachers to employ outdoor learning is adverse weather (Rieckenberg, 2014, Shume & Blatt, 2019). In some regions, winter weather is thought to present obstacles for facilitating outdoor experiences (Ernst, 2014; Rieckenberg, 2014; Shume & Blatt, 2019). In other regions, extreme heat and humidity can impact the length of time students should be outside (Texas School Safety Center, 2021). The primary concern is students not having the appropriate clothing or supplies available for different weather situations (Ernst, 2014; Rieckenberg, 2014; Shume & Blatt, 2019). Examples of appropriate clothing and supplies are winter and rain apparel, sunscreen, and proper footwear (Shume & Blatt, 2019).

Strategies to Address the Barriers to Outdoor Learning

In a traditional classroom setting, teachers plan and use a variety of instructional strategies to engage and motivate their students. Using outdoor learning requires teachers to step out of the comfort of their indoor classroom (Rieckenberg, 2014). By doing this, students have the chance to practice problem-solving and critical-thinking skills (Ernst & Monroe, 2004; Montero et al., 2018; Rios & Brewer, 2014). Students may see their motivation to try new things increase (Becker et al., 2017; Kuo, et al., 2019). For some students, asking questions in a public setting or collaborating with peers may seem like a risk (Price, 2019). However, in outdoor learning, engaged in an authentic task, students may find themselves more willing to try doing new things (Farnham & Mutrie, 1997; Price, 2019; Szczytko et al., 2018). Therefore, it is important for teachers to model and encourage a growth mindset, to foster student interest in nature, to facilitate authentic learning opportunities, and to address time, space, monetary, and weather constraints to effectively integrate outdoor learning into their classroom culture.

Modeling and Encouraging a Growth Mindset
For outdoor learning to be successful, teachers must demonstrate a can-do mindset as confidence may affect their ability to embed outdoor learning as a regular occurrence (Rieckenberg, 2014). If teachers lack confidence in a specific area, working to develop a growth mindset can help (Dweck, 2006). Teachers often want to be considered the expert and do not want their students questioning their knowledge (Scott et al., 2013). This kind of mindset needs to be examined, reflected upon, and finally, discarded, as it exemplifies a fixed mindset. A fixed mindset is the belief that intelligence or abilities are static (Dweck, 2006). The fear of the unknown is a common thread for teachers who want to add outdoor learning to their practice (Rieckenberg, 2014). A fixed mindset can be detrimental in education for both students and teachers as it fosters a fear of making mistakes (Dweck, 2006). A culture of experiential learning should embrace failure and mistakes as growth (Kolb & Kolb, 2018). This culture can be started and nurtured by the teacher.

By contrast, adopting a growth mindset can help teachers feel more comfortable with making mistakes. They do not need to be the experts in environmental education content to take students outside and engage in outdoor learning. Although it is natural for a person to ebb and flow from fixed to growth mindsets depending on the situation (Dweck, 2006), teachers can apply different strategies to develop their growth mindset, particularly for teaching outdoor learning.

One strategy for teachers to use when working on growth mindset is to make a plan to model the Experiential Learning Cycle (Kolb & Kolb, 2018). The cycle has four components: experiencing, reflecting, thinking, and acting (Farnham & Mutrie, 1997; Kolb & Kolb, 2018). To implement this cycle, teachers will plan a short outdoor lesson, just as they would plan an indoor lesson with learning objectives, activities, and assessments, either informal or formal, formative
or summative. After initial planning (acting stage), they teach the lesson (experiencing stage) and observe what the students are doing and how they are engaging in the lesson (reflecting stage). Teachers then take those observations and think about what changes to make (thinking stage). The next step is to create another outdoor lesson that includes thoughtful adjustments from the previous lesson (acting stage) and then teach that lesson (experiencing stage), continuing the cycle (Kolb & Kolb, 2018).

**Fostering Interest in Nature**

Slow pedagogy, a relatively lesser-known instructional approach, can help foster student enthusiasm for nature (Chang, 2020; Jørgensen, 2017). As cited by Chang (2020) and Jørgensen, (2017), Payne and Wattchow’s (2009) theory of slow pedagogy is the antithesis of often-hurried instruction and a fast-paced classroom environment. Slow pedagogy requires educators to adapt their expectations of time constraints and encourages students to not rush their time connecting with the environment and learning content (Chang, 2020). This type of strategy encourages learners to connect to the world around them (Jørgensen, 2017). To start, teachers can implement slow pedagogy to introduce a *sense of wonder* with their students. A sense of wonder relates to feeling awe or being fascinated with nature and wanting to question the incredible and ever-changing facets of the natural world (Chang, 2020; Jørgensen, 2017). Outdoor learning provides an ideal situation for educators to practice teaching slow pedagogy and encouraging students to connect to nature.

Using the Buddhist practice of *suchness* to complement outdoor learning instruction can help to provide a foundation to planned activities and content-driven lessons (Chang, 2020). Suchness is the ability to appreciate and value what is in front of them for what it actually is (Chang, 2020). Louv (2008) mentions a similar approach to nature-based learning and that is
spirit of place. This approach draws on the ideas that people enjoy the feeling of being in a natural space and they connect their minds to it as their bodies experience it (Louv, 2008). These philosophies highlight the peacefulness and quiet contemplation students may encounter as they experience outdoor learning (Chang, 2020; Jørgensen, 2017; Louv, 2008). Teachers can cultivate suchness, spirit of place, or wonder with students by going outside to make observations of clouds. Teachers can ask the students to sit for a period of time and watch the clouds, thinking about how they move, and change shape. Teachers can embrace whichever philosophy works for them and their students - suchness, spirit of place, finding wonder or another idea to help connect the students’ sense of self to their sense of the natural world.

Facilitating Authentic Learning

Outdoor learning is a way to provide students with action-based and concrete experiences that are at the heart of modern instructional practices (Akamca, 2017; Becker et al., 2017; Bensten & Jensen, 2012; Jose et al., 2017). Cultivating or maintaining a school or local garden is a common strategy used to facilitate outdoor learning (Becker et al., 2017; Cameron & McGue, 2019; Khan et al., 2019; Louv, 2008). These activities provide a broad spectrum for educators to explore when planning science, math, and literacy lessons that connect to experiential learning. For example, students can use planting and gardens to study the water cycle or the life cycle of plants. Students can encourage community involvement by using gardening to understand the food chain and the societal impact of producing food for others. Gardening can invoke a sense of collaboration and community for the students (Louv, 2008).

Another real-world experience is to explore the environmental impact of the school’s grounds on the ecosystem (James & Williams, 2017). The teacher may have the students focus on the effects on the school or on their local watershed district. Teachers can engage students in a
variety of activities in this kind of exploration: collecting water, observing water runoff and possible erosion, collecting trash from school grounds, or cleaning a storm drain. Teachers can connect these activities to content in the classroom (Becker et al., 2017; Ernst & Monroe, 2004; Fägerstam & Blom, 2013; James & Williams, 2017). Students can conduct water quality experiments and compile data for their own analysis. Reading complex texts related to the content can provide depth to the outdoor learning activity (James & Williams, 2017). Teachers could present current news articles that describe the importance of water quality around the world to help connect literacy to the experiential learning.

A third authentic learning opportunity for teachers to use outdoors is to incorporate a more artistic approach that involves students creating, designing, or innovating. One way to do this is to ask students to draw an ecosystem or a habitat prior to visiting one, based on what they already know (Jose et al., 2017). Once they have the opportunity to experience the space – whether it is on-or-off school grounds, they will draw or map it out again. The students can compare their previous knowledge with new learning. This connection will give students a voice as they create the artistry, while demonstrating to the teacher what they have learned (Jose et al., 2017).

Although many learning opportunities can take place on school property, there are several experiences that can engage learners in a location away from school. If teachers are able to plan experiential field trips, they can make an incredible impact and extend the lesson back into the classroom setting. Some of these experiences include camping, hiking, orienteering, sailing, being on a working farm, or visiting a state or national park (Becker et al., 2017; Price, 2019). With each of these learning opportunities, teachers can set objective goals for students, give guidelines for learning, and then allow them the freedom to engage in their learning in a
natural setting. The skills that may be developed on these excursions are mutual agreement, contributions by all, strategic planning, critical thinking, coping with difficult situations outside of individual control, and listening to alternate perspectives (Becker et al., 2017; Price, 2019).

**Addressing Space and Monetary Constraints**

Teachers can regularly engage their students in outdoor learning when they have a growth mindset and are willing to use instructional methods for slow pedagogy and content-based instructional components. However, teachers describe time, available space, and money as constraints to outdoor learning (Carrier, et al., 2013; Rieckenberg, 2014; Rios & Brewer, 2014; Scott et al., 2015; Shume & Blatt, 2019). Many examples of outdoor learning found in the research demonstrate elaborate and potentially costly experiences. However, there are ways teachers can adapt the lessons to be more cost-friendly, use their available space, and incorporate them into a daily routine.

One example of an elaborate outdoor learning experience is when a group of students experienced field study at a delta preserve (Jose et al., 2017). Potential costs associated with this type of field experience are cost of admission and transportation. During this all-day experience, students actively studied and engaged with the ecosystem, focusing on the living and non-living species in the water and surrounding areas (Jose et al., 2017). A low-cost alternative to this specific experience could be walking to a local water source, such as a pond, a river, or a lake. Students could bring small buckets to collect any macroinvertebrates to analyze the health of the water source. Teachers could facilitate the students observing the ecosystem and drawing a habitat map before arrival and then after the experience to compare and contrast what they knew and then what they learned. If a water source is not nearby, any ecosystem could inspire
discussion around animal habitats, what living and non-living things are native to the system, or how the geographic features are affected by people.

**Finding Time for Outdoor Experiences**

One way for teachers to address time constraints is to find times that students are already outside. Teachers can meet students at the main entrance at the start of the day and begin observations of the morning weather patterns or they can meet their students outside after recess since the students are already dressed for the weather and in the space where learning will be taking place.

Another way for teachers to address time constraints is to plan an outdoor learning time with another class or group. Teachers can coordinate with a younger or older grade and establish an outdoor buddy program or they can work as a grade-level team. This can address the time concerns as teachers can divide up the different aspects of planning the lesson to help ease the burden. This type of partnership can be advantageous for both or every teacher involved in the planning as they will be collaborating, while increasing the presence of an outdoor learning culture in the school (Scott et al., 2015).

**Attending to Adverse Weather**

Weather is an important consideration for planning; rain, snow, and extreme hot and cold temperatures can impact outdoor learning. Many school districts provide extreme weather safety guidelines for the time students spend outdoors (Saint Paul Public Schools, n.d.; Texas School Safety Center, 2021). Teachers should follow the guidelines and ensure students are not outside in dangerous weather conditions. These guidelines may also include a list of appropriate clothing and necessary supplies for cold weather in Minnesota, a Midwestern state (Saint Paul Public Schools, n.d.) or for a warm weather state, like Texas, that may have heat advisories (Texas
School Safety Center, 2021). “Operating with a mantra of ‘there is no such thing as bad weather, only bad clothing,’ most teachers and students continue to get outdoors regardless of the weather and temperatures” (Rieckenberg, 2014, p. 122).

Teachers can overcome this barrier by following three steps prior to expected winter weather months. Step one is communicating to families about outdoor learning expectations and what outdoor clothing, footwear, and supplies will be needed. This gives families time to gather the necessary gear. The next step is asking students to bring in their clothing and supplies so teachers can ensure everyone has what is needed. If students are missing items, teachers can coordinate with families and administrative support in the building to procure them. The third step is to ensure students can be independent in dressing for snowy or rainy weather or applying sunscreen if they will be out in the sun. Teachers can incorporate practice sessions at the beginning of the year or season to get students in the habit of preparing themselves for a safe outdoor learning experience. This type of practice can also positively impact time restraints as teachers establish an outdoor learning routine and making preparation for outdoor learning more efficient (Ernst, 2014).

The sooner teachers can begin incorporating these some or all of these strategies to help connect more to nature, more to their own learning, and more to their peers, the faster they will likely see marked improvement in student motivation, critical thinking, and socialization.

**Discussion**

For many educators and schools, a culture of outdoor learning must be created. This cultural shift can start with just one teacher (Rieckenberg, 2014). One teacher who recognizes that wonder and suchness are not restricted to only children (Chang, 2020). One teacher who believes that helping students find motivation will help them be more successful in their learning.
Using outdoor learning as an instructional strategy

(Becker et al., 2017; Cameron & McGue, 2019). One teacher who recognizes that traditional classroom strategies are not always effective in preparing students for future success (Mirra & Garcia, 2020). When teachers start to witness the positive influence that outdoor learning can have on their students, other teachers will likely be inspired to follow their lead.

"In the outdoor classroom, there is a presence of tacit knowledge which is very hard to describe, such as the stinging sensation from touching a stinging nettle, the taste of a sun-ripe raspberry, or the smell of autumn in the wet grass" (Bensten & Jensen, 2012, p. 208). Outdoor instruction can provide a unique learning environment for students that they cannot experience indoors in a traditional classroom sitting at a desk completing a worksheet. This is demonstrated as true throughout a variety of learning contexts. Some may consider that outdoor learning should only apply to elementary-age students. However, the research shows a much broader spectrum of ages that can benefit from instruction in a natural setting (Becker et al, 2017). High school students engage in field data research of local water sources (Jose et al, 2017). Preschool children find outdoor learning allows them to learn through natural play (Akamca, 2017; Cameron & McGue, 2019). Middle school students actively work with engineering design, use hands-on methods to interact with natural materials, and perform rigorous data collection (James & Williams, 2017; Price, 2019). Fourth grade students describe their first experience in the Muir Woods as life changing (Montero et al, 2018). Twelfth grade students who are immersed in environmental education consistently throughout their four years of high school are recognized by an increase of environmental stewardship and awareness (Ernst & Monroe, 2004).

Intermediate elementary students have the daily opportunities to engage in outdoor learning with a school commitment to natural grounds and teacher preparation (Khan et al, 2019). Outdoor learning as an instructional strategy is a method that has been proven to be effective for all
students’ critical thinking and problem-solving skills, as well as their social and behavioral
needs. The benefits of outdoor learning can be generalized to fit the needs of all students, from
preschool to high school graduation. It is imperative that educators of any age group recognize
the value of outdoor education and work to integrate it.

Teachers can implement one, some, or all of the activities presented in the previous
section into their own practice when they are prepared with the knowledge of how outdoor
learning can benefit students and an understanding how to overcome potential barriers.
Educators should seek to grow in their own learning, while promoting unique and authentic
learning opportunities for their students. Engaging them in outdoor learning provides an
educational platform to do this.

One implication for teachers is if their district does not offer training to help establish an
outdoor learning culture, teachers should seek professional development on evidence-based
strategies to teach outdoor experiences while integrating standards-based curriculum (Louv,
teachers and how to incorporate outdoor learning. One of the recommendations by Louv (2008)
to further a love of nature in children is to create a nature club for teachers. This can be formal or
informal, sponsored by the school or district or simply created by like-minded educators. It can
be a collaboration of teachers and administrators who share ideas and knowledge in a natural
setting (Louv, 2008). As an added benefit, outdoor experiences can also improve the mental
health of educators (Louv, 2008). This benefit can help inspire the teachers to add new methods
of outdoor learning experiences within their classroom.

Another one of the important implications for educators at all levels – teachers and
administrators – is engaging the community through a school culture that embraces outdoor

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learning (Louv, 2008; Scott et al., 2015). Teachers can ask the grown-ups in children’s lives to volunteer their time helping work in the garden (Louv, 2018). Administrators can seek local environmental experts to come and share their knowledge with students (Louv, 2008). Principals or Curriculum Specialists can establish a Junior Naturalist Club at school that provides students with extracurricular connections to their outdoor spaces (Louv, 2008; Rieckenberg, 2014). These community-driven initiatives add to a rich culture of natural spaces and outdoor learning.

To the teachers who want to observe students experiencing suchness by catching snowflakes and to expose their students to this type of learning, the teachers who want to work towards a school climate of embracing the unknown, the teachers who want to nurture a culture of growth mindset and authentic learning in themselves and in their students: you can do it. Lean into the uncomfortable. “It just takes one to start a movement” (Rieckenberg, 2014, p. 163).
References


Multilingual Learners in Mainstream Classrooms

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Mai Kong Pheng Yang is a third grade teacher at Hope Community Academy. She has been teaching for one year and was a in house substitute teacher for half a year. Mai graduated with her Bachelor's degree in Fall 2019 from Minnesota State University, Mankato. During her undergrad, Mai was able to study abroad in South Korea and student teach in Texas. These experiences allowed Mai to peak an interest in teaching English and supporting multi-language learners to grow academically and socially. She would like to thank her professors and mentors for their guidance during her research. She would also like to thank her family and friends for them support and encouragements.

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Proper APA Citation for this Article is:
Abstract

The United States of America has always been known for its diversity. A country that promises to “The Land of the Free.” Many people migrate in hopes of having a better future for themselves and for their children. Along with the high diversity rates in the United States, the different number of languages are also high and yet English is the main language taught in schools. As English maintains its dominance in the education system, many students fall into the category of an English Language Learner. These students are expected to learn the English language to strive in the education system and yet these students are not given the proper supports to help them succeed.

Each day in a mainstream classroom, students are presented with academic vocabulary and expected to learn these on top of learning a new language. This does not take into account the content students must learn and the tests they need to take. Students who do not speak English as their main language, are set to struggle in classrooms where help is not provided. Although many schools have English Language teachers, those educators are only presented with an allocated amount of time to help the student. These times are done through push in or pull out methods, leaving English Language Learners to fend for themselves in the mainstream classroom. This article provides an insight on how content teachers can work collaboratively with English Language teachers to improve learner’s success rates in the general classroom. Additionally, throughout this article, the term Multilingual learners will replace English Language Learners as the term more adequately acknowledges that students may speak multiple languages and does not define their student identity by their learning of English only.

Keywords: multilingual learners, English as a Second Language, co-teaching.
Introduction

Mainstream teachers must take on the responsibility of learning the methods needed to provide extra support for Multilingual Learners (MLL) outside of their English as a second language (ESL) instructional classrooms. The time obtained for MLL instruction is simply less compared to the amount of time MLLs spend in the mainstream classroom. As the number of MLLs in settings around the world increases, so too does their presence in so-called “mainstream” classrooms (Peercy, 2018). In American schools, students who are non-native English speakers spend most of their time in a classroom where their teacher is not ESL certified. In these environments, multilingual students are less likely to comprehend the content being taught to them without the support they need.

Statement of the problem

“In 2003, nearly 50% of all MLLs received minimal services (between 0 and 10 hr per week) compared to 32% a decade earlier (Center on Education Policy, 2005). It is likely that the current percentage of underserved MLLs is even higher” (De Jong, 2013). Students who receive assistance for ESL only have an allocated time with a certified ESL teacher. This does not do students enough justice with the number of hours they spend in school. Through this blocked off period, students are expected to learn what their classmates have already obtained growing up in an English-speaking household. In addition, many content area teachers approach teaching MLLs from a deficit lens, as well. This is detrimental to MLLs due to students not being held at the same expectations as their classmates or being held capable.
Importance of the Study

Mainstream teachers need to work with ESL teachers in a collaborative format. This can be done through co-teaching, co-planning or just check ins (Peercy, 2018). Through collaboration, not only will students benefit from the extra instructional time but so will the teachers. These collaborations can help mainstream teachers obtain new skills that they can apply even when the certified ESL teacher is not in the room, skills that can benefit MLLs and non-MLLs as well. (Peercy, 2018). Mainstream teachers can also focus on vocabulary and how to provide needed skills MLLs need when using vocabulary in their work. To complete collaboration, mainstream teachers, and ESL teachers must fully work together to ensure that collaboration is met thoroughly (Peercy, 2018). Collaboration can also take place instead of using the push in and pull out methods that often-hinders MLLs’ learning.

Educators argue for the “importance of attending to academic language as it is integrated with content and supports emerging bilingual students’ meaning making within and across disciplines” (Pacheco, 2017). Mainstream teachers must know how to teach academic language in ways that MLL students can easily soak up the knowledge given to them. Teachers need to provide students with clear instruction that includes translating activities to tap into students’ unique cultural and linguistic strengths and deepens students reading comprehension skills (Daniel, Jiménez, Pray, & Pacheco, 2019). Through guided practice, students are more likely to grasp the content given to them compared to completing an activity on their own. With increasing population of MLL students in mainstream classrooms and the scaffolding of academic language, activities play a big role in these scaffolds.
Focus of the Study

This review will provide an overview of the research that asserts the ways in which multilingual learners may be more successful when they remain in the mainstream classroom and when the content and ESL teachers work collaboratively within the classroom. Although push-in and pull-out methods are mainly used in schools, collaborative classrooms benefits students more significantly. This study will discuss the benefits that collaborative classrooms have on MLLs and their educational journey.

The focus of the research is based on the factors that content teachers and ESL teachers must take into consideration when working with an MLL in a general education classroom. There are multiple factors when educators are working to get to know their students inside and outside of the classroom. These factors play a significant role in an MLLs’ educational journey as they set MLLs apart from their peers. Educators must remember that an MLL’s culture must be embraced and seen as an asset.

Definitions of Terms

Multilingual Learner: a student who is learning the language of instruction at the same time of learning academic content. (The term Multilingual learner is the preferred term in this article because it allows students who speak other languages, the opportunity to embrace their assets instead of seeing their knowledge of another language as a barrier to their education.)

English Language Learner: a student who comes from non-English speaking homes and is learning English.

English as a Second Language (ESL): a program to help students who speak English as a second language obtain skills to become proficient learners.
Co-teaching: when a content teacher and an ESL teacher work together to provide instruction to all students in the general classroom
Review of Literature

Introduction

Many school systems have an ESL program for their MLLs. The methods of push-in, pull-out and co-teaching are common in these programs. These methods are applied to help MLLs fully comprehend and learn their academic content that is being taught to them daily. Though there are three methods, not all three are often found in one school. Many schools opt for one of the methods depending on the number of ESL teachers they have. The traditional pull-out method can be less effective due to the disconnect between what is happening in the mainstream classroom and in the pull-out placement (Williams, H., & Ditch, R., 2019). Content teachers who plan lessons on their own often do not dedicate time to communicate with the ESL teacher. What is being taught in the general classroom might not be taught in the ESL classroom, causing MLLs to have a disconnect with their peers. Leading to the research examined in how co-teaching can be more beneficial to MLLs in a classroom setting. With co-teaching, MLLs are able to stay in their classroom without missing any class time or social interactions with peers.

Lack of Academic Success for MLLs

In Minnesota, as of 2016, around 15% of students speak a language other than English at home and 7% are formally classified as MLLs (Williams, C.P, 2016), although all 15% of these MLLs might still benefit from some aspect of English language instruction. For MLLs to fully acquire the language, programs must be put into place for MLLs to obtain the English language. In Minnesota, 40% of MLLs are Spanish speakers and 17.5 % are Hmong speakers (Williams, C.P, 2016). Disregarding this fact, many programs still do not cater towards students’ communication skills, cognitive abilities, and cultural identities. According to Williams (2016), the average 2015 NAEP Reading Performance discrepancy between MLLs and non-MLLs was
36%. MLLs, achieved 6% on at/above proficient level while 42% of non-MLLs were already at the same level (p. 13). This statistic showcases that current programs of push-in and pull-out methods are no longer working for our MLLs or perhaps have never been the most effective for our MLLs.

**Critical Language Objectives for MLLs**

Due to the documented lack of academic success for MLLs, students are now required to take the WIDA Access test. In 1974, in the case Lau v. Nichols, the Supreme Court ruled that U.S. public schools must establish policies ensuring MLLs have access to linguistically appropriate accommodations for them to experience a “meaningful education.” (King, K., & Bigelow, M., 2018). Then in 2002, the No Child Left Behind (NCLB) Act, which mandated new standardization and accountability requirements for American public schools, focused new attention on MLLs and required U.S. states to annually measure MLLs growth (King, K., & Bigelow, M., 2018). Although the NCLB act is no longer in place now, the Every Student Succeeds Act (ESSA), was created in 2015 to make accountability for ELs a priority and to use WIDA as a screening tool (King, K., & Bigelow, M., 2018). The WIDA Access test assesses students across four language domains (listening, speaking, reading, and writing) and places them on the six-level WIDA Proficiency Scale (1 Entering, 2 Emerging, 3 Developing, 4 Expanding, 5 Bridging, and 6 Reaching). To ensure that MLLs pass the WIDA Access test, educators must take these language domains into account by creating language objectives.

Language has many different aspects, such as reading, writing, speaking, and listening. These aspects play such a huge role in daily instruction in a classroom that they are now objectives intertwined into curriculum. When teachers are writing their content objectives, they also are now held accountable to explicitly plan their language objectives. Teachers must process
how a lesson can help fulfill the language domain objectives: reading, writing, speaking, and listening. (Lenski et al., 2006). Through these objectives, MLLs as well as teachers can benefit from the skills and strategies needed during the lesson.

An example of a reading-specific objective would be “Students will be reading the passage from the text for the first five minutes of class.” This would also apply for the other domains with the objective showcasing what the students would be doing to fulfill that specific domain. (Newton et al., 2018) These objectives can be planned with an ESL teacher, ensuring that MLLs’ needs will be met. MLLs need vocabulary instruction on developing academic vocabulary, complex syntax understanding for quality writing, and reading comprehension strategies taught by all teachers in the school, not just the ESL teachers (Calderón, & Carreón, 2018). When teachers adapt pedagogy to effectively teach academic language to MLL students, this will positively affect all students in the classroom. “With students at differing levels of linguistic proficiency and understandings of content, scaffolding students’ language practices, rather than solely working toward a prescribed language objective, offers opportunities to recognize and build on student language.” (Pacheco, 2017). This can be done in a universal design in which not only helps students with disabilities, but also helps everyone in the classroom.

Context for Learning

Understanding Communities

Teachers must conduct the most important step when assessing their MLLs: know their students’ lives in and outside of the classroom (Von Esch, 2018). Being able to observe a student inside of the classroom is easier for teachers due to the students being in the space. Teachers can make observation notes on who the MLLs talk to in the room. This can be who
their friends are and who they choose to not have relationships with. Teachers can also see how the MLLs react when put in certain situations. This will allow the teacher to see how the student handles the situation. Teachers can also see what skills students struggle with and what skills they can apply when given certain activities (Von Esch, 2018). Through these observations, the teacher can see what kind of learner their students are while in the classroom as well as their behavior with their peers and with their schoolwork. For example, if a student is shy and keeps to themselves but excels in their schoolwork, the teacher can scaffold by starting with independent work to partner work and gradually into more group content to help the student build their self esteem in working with others.

The most important factor is the set of knowledge and experiences MLLs gain in their lives outside of the classroom, otherwise known as a student’s funds of knowledge (De Jong, 2013). Students’ funds of knowledge is an aspect of the students’ lives that the teacher cannot control but should learn more about. A student’s personality can be different in and out of the classroom. Many students go back home and must be the older siblings with many responsibilities. Others may go home and not have food on the table or a proper place to sleep. Other factors to take into consideration is the student’s cultural background. Some students come from backgrounds where mothers are more present in their child’s educations compared to their fathers. This can also include the difference between white American culture of immediate family and other culture’s definition of immediate family. For example, in white American culture, parents would be primary contacts but in other cultures it can vary from parents, grandparents, aunts or uncles. Others may come from backgrounds which affect what they can and cannot eat inside and outside of school. These are all factors that can affect their learning in the classroom as well as their growth. As a teacher, getting to know their students’ lives in and
out of the classroom should be a top priority to contributing to their academic growth. If an educator does not know who their students are, how can they know what specific strategies are needed to help their student succeed in their educational journey?

**Home Language Survey**

There are many surveys that teachers can send home with their MLLs. These surveys come with good intentions but can be detrimental to an MLLs education if written from a deficit lens. A well-known way to assess your MLLs is sending home a home language survey. A home language survey is a questionnaire that is taken by parents or guardians of the MLL student. This allows teachers to see which students will be provided with ELL services as well as getting to know the student’s home language (King, K., & Bigelow, M., 2018). The survey consists of asking questions such as: what the primary language is spoken at home, has the student received ELL services before, etc. Once teachers have received this information, they can apply the answers into creating a plan that will benefit the student’s growth by working with the ESL teacher. This survey can also see if the student is qualified for ELL services and what steps need to be taken after the survey is returned and filled out (King, K., & Bigelow, M., 2018).

These surveys will ask questions to help schools gain a better understanding of the students but can still be subjugated to bias as some students that may speak predominantly their native tongue at home, does not make them an ESL student. Schools may use the information given in the home language survey to place students in ESL classrooms even though students are proficient in English. Teachers can use these surveys and stray from a deficit lens or be non-judgmental by using the survey as a form of how to contact parents and what language parents are more comfortable in with communication.
Effective Teaching Strategies

Vocabulary

Through a classroom lens, students spend a significant amount of their time talking with their peers. This will allow them to gain conversational vocabulary but does not always benefit them in academic vocabulary. Vocabulary learning should involve students being actively engaged in activities that allow students to experience words in rich contexts. MLLs need high-quality vocabulary instruction throughout the entire day: during reading instruction, content learning, as well as with common words and phrases (Hellman, 2018). This will provide teachers with the necessary skills by planning activities which not only scaffold academic vocabulary but also help build skills students can use later. The skill of MLLs using post it notes to mark and write down unfamiliar words for teachers to review by Calderón and Carreón (2018), showcases how students can be active learners in their education. Through each lesson, there are academic vocabulary words that students need to comprehend. Through this comprehension, students will gain the knowledge of what topic is being taught and can also hold academic conversations with their peers.

The scaffolding methods must support the content objectives and must respond to the actual language objectives of the classroom to help students have a purpose of doing the activity (Pacheco, 2017). If done correctly, all students in the classroom should be affected positively. Through scaffolding of the academic language using language objectives, MLLs and non-MLLs can lean on one another and help each other’s growth. Students can help their peers in skills they know and work on what they lack. When teachers have become the monitor and students have become the teachers, that is when learning has happened and is shown through students fully gaining the knowledge of the lesson as well as the academic vocabulary (Pacheco, 2017).
Collaborative Learning

Placing MLLs in mainstream classrooms raises important questions about the adequacy of the preparation of mainstream teachers to work with ELL (De Jong, 2013). Most mainstream teachers have taken on the general education route, which often provides minimal if any ELL training. Teachers are infrequently given opportunities to obtain skills and strategies needed specifically for their MLL students. Most often if a course on English language education is offered, it is only one that touches briefly on working with MLLs. This still does not provide a mainstream teacher enough skills to properly teach their MLL students. An important method to use in this case would be collaborative learning. Collaborative learning is essential in the findings that MLLs can have more quality time with both teachers (mainstream and ESL) and advancing in the skills and strategies they need. Through collaborative learning, teachers and ESL teachers work together in planning curriculum, lessons, and student growth plans. These are essential as they help the two teachers overlap ideas and suggestions.

Co-Teaching Approaches

Co-teaching has been defined as “two or more professionals delivering substantive instruction to a diverse, or blended, group of students in a single physical space” (Peercy, 2018, p. 2). A positive outcome of co-teaching is allowing the MLLs to stay in their classroom. Through this act alone, a student will feel less isolated from their peers and will be given the same opportunities as their classmates. When students are pulled out of the classroom, their self-esteem and self-awareness might be deeply affected in the aspects that they are different from their peer and it has clearly been pointed out by taking them out of the classroom. If given the opportunity to stay in the classroom, many students will feel less detached from the classroom and will have the same opportunity to learn the same content level as their peers (Martin-Beltrán
& Peercy, 2012). As for the push-in method, MLLs might feel as if they have been pointed out as “special” to their peers. Having a specific teacher come in to help them and them only can make MLLs feel like they are inferior to their peers which is why they need another teacher. This can also make MLLs respond by choosing to not participate in learning or receiving help from their ESL teacher.

Through co-teaching, teachers will be given the opportunity to work with one another in ensuring that all content level materials are proficient in helping not only the MLL students in the room but also the rest of the class. Even when teachers do not co-teach, they can still put structures in place to coordinate their instructional efforts (Peercy, 2018). There will be days in which the ESL teacher is not able to be in the classroom, on those days, both teachers can plan the materials needed to ensure the success of the MLLs. Teachers can also take off planning days to be able to sit and plan out the curriculum together.

Through co-planning, a mainstream teacher can ask an ESL teacher for help when discussing content and lesson plans. The ESL teacher can also obtain new knowledge of content-based information. During this time, both teachers can also work on how they can co-teach during a lesson. Collaboration during a lesson can be done through the following approaches: one teacher teaches, the other teacher observes; one teacher teaches, the other teacher assists; station teaching; parallel teaching; alternative teaching; and team teaching (Peercy, 2018).

<p>| Table 1. Six Main Co-Teaching Models. |</p>
<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>One teach, one observe</td>
<td>One teacher provides instruction to the large group while the other observes the teacher, a student, or a group of students for a specific purpose</td>
</tr>
<tr>
<td>One teach, one assist</td>
<td>One teacher provides instruction to the large group while the other circulates, supports, and assists individual students</td>
</tr>
<tr>
<td>Station teaching</td>
<td>In small groups, students rotate among several learning activities; often, each teacher leads a station, one station is an independent learning station, and additional stations are supported by volunteers</td>
</tr>
<tr>
<td>Alternative teaching</td>
<td>One teacher provides instruction to the large group while the other preteaches, reteaches, or assesses a small group of students for a short period of time</td>
</tr>
<tr>
<td>Parallel teaching</td>
<td>Each teacher delivers the same instruction to his or her half of the large group</td>
</tr>
<tr>
<td>Team teaching</td>
<td>Both teachers equally deliver instruction to the large group</td>
</tr>
</tbody>
</table>

https://cornerstone.lib.mnsu.edu/icitl/vol2/iss1/5
Table 1. Six Main Co-Teaching Models. Adapted from “Co-teaching with strategy instructions,” by G. Conderman & L. Hedin, 2013, July 26, Intervention in School and Clinic

According to Peercy (2018), the first and second approach, one teacher teaches, the other teacher observes; one teacher teach, the other teacher assists; can be showcased as the mainstream teacher observing the ESL teacher’s lesson and learning new skills or the other way around. This is beneficial to the teachers as they are learning from one another. While this is beneficial for students as they can see two different teaching styles. The third approach, station teaching, can be done just as described. The teacher and ESL teacher create stations in which all students can rotate from. Through these rotations, students can meet both teachers as well as have independent learning time. The fourth approach, parallel teaching, is done when students are broken into two groups and both teachers teach in two different parts of the room. Although this is beneficial, some students might feel like they are less smart than the other group. The fifth approach, alternative teaching, is done through one teacher teaching the first part of the lesson and the other teacher teaching the second part. This is like the last approach of team teaching where teachers bounce ideas off one another while teaching a lesson (p. 2).

Scaffolding the Content

Teachers must also be aware of a student’s Zone of Proximity. The Zone of Proximity is what a student can do alone, with guidance and what they cannot do (Walqui, 2006). Many times, if done correctly, teachers can use what students already know to aid the growth of the skills they need guidance on and skills they have yet to obtain. Consistent scaffolding over time can help all students recognize their languages are not only validated in the classroom but also
helpful for literacy learning (Daniel, Jiménez, Pray, & Pacheco, 2019). Through Zone of Proximity, a student can slowly see their growth over time. A skill that was once hard for them to do alone, can now be done by themselves.

Students can see that their home language can also help them grow in their classrooms as well. Many times, teachers can use a student’s home language as an advantage by tying in similar stories to the content being learned or similar vocabulary. In a study led by Zapata in 2016, a teacher name Susan incorporated the many different languages her students spoke into her classroom. When a new student from Japan arrived, Susan made sure to learn key phrases in Japanese as well as incorporating Japanese picture books and learning the language into her classroom. This allowed her MLL to embrace her home language as well as her other students to build curiosity and awareness of other languages and cultures (Zapata, 2016). Through this implementation, the teacher was able to show her view on students’ languages. The views being that all languages should be embraced and used in the classroom and that different languages can be spoken and learned in the classroom as well, other than English.

Once students see that vocabulary in their home language can be translated into English as well, they can build their confidence in learning more academic based vocabulary. Using an MLLs home language in the classroom can also build a great classroom community. Teachers can have student present a new word in their home language to the classroom once a week to help build classroom knowledge of a student’s language. Teachers can also create anchor charts where all students are able to see how words in English are said in another language. This can help other students want to gain more knowledge of other languages besides English in the classroom. Through this, MLLs can see a more positive light in knowing more than one language instead of seeing their native language as a negative (Zapata, 2016).
A great way to build a student’s confidence is letting students see their growth through writing. When students begin writing at first, they use all the vocabulary they know but many times they are not academic vocabulary. Scaffolding in writing to help students understand key points as well as how academic languages can be presented in their writing (Lee, 2018). Teachers must first start off with transition wording before building onto conjunctions, content vocabulary and higher-level words. Through writing, students can also see their growth from words to sentences to paragraphs. As students build on their academic vocabulary, they can form sentences which will eventually change into paragraphs. Teachers can use this to an advantage by showing an ELL their growth in hopes that it motivates them to keep striving positively towards their academic growth.

Benefits for All Students

After a teacher and ESL teacher have built the foundation of their collaboration, they can now focus on their students. All students in the classroom are important and MLLs especially need to know this. By building a classroom in which positively shows light on culture, language and academic content, all students can grow (King, K., & Bigelow, M., 2018). Through co-teaching, students can benefit from having two teachers in the classroom and twice the skills and strategies being taught (Peercy, 2018). Most times educators must remember that all students need the language objectives and not just MLLs. Through language objectives, students can see what exactly they are doing in a lesson and how the content is being presented. Most teachers need to remember that most lessons are not made just to be taught. Most lessons are successful when students are the focus and if they are learning the content. Once a teacher has changed their focus points to the students, then a lesson has been successfully taught.
Teachers must achieve this goal by preparing activities in which students are able to work in groups and can have pair discussions (Pritchard, & O'Hara, 2017). Students learn best when bouncing off ideas from one another as they are all around the same age and cognitive level. As an adult the form of teaching used can be done in ways an adult brain can process given information. Educators must teach these to students in hopes that they can digest the given information but in theory students learn best from their peers (Zhang et al., 2016). While the intentions of teaching academic vocabulary are through content, most times this approach can be done through pair discussions and other incorporated classroom strategies. As time has changed, academic vocabulary is not just learned through readings or spelling anymore. Academic vocabulary can be learned through interactive word walls, activities, etc.

Creating a universal design for a classroom would be one in such that the classroom contains two teachers, a mainstream and an ESL teacher. Both teachers’ main focuses are all students and their growth throughout the school year. This is far better in comparison to using the push in or pull out methods with MLLs. Through those methods, MLLs can feel outcasted or less than their peers. These methods can also make MLLs feel as if they are not a part of the classroom and lose that sense of community when they return into the mainstream classroom.

**Challenges**

ESL and mainstream teacher collaboration can also face challenges. These challenges could be the teachers’ ability to engage with one another. Communication is very important in any aspect of life. Due to the ESL teacher and mainstream teacher working together, they both must be open to ideas related to their teaching differences and use these differences to support
their students. Other issues can stem from “lack of time for planning, communication, shared vision, willingness to discuss and work through disagreements, and lack of structural and administrative support.” (Peercy, 2018). If a school were to take on collaborative instructional teaching, there needs to be effort made by teachers and administrators in order for this collaboration to be successful. Although there has been successes and challenges in this instructional approach, teachers must still work collectively to benefit their student’s educational success in academic language.

**Conclusion**

In a perfect world, all school buildings would have an ESL teacher who would be able to provide enough time and content to help all the MLL students in the building. Each classroom and building will have enough ESL teachers in each room to help co-teach and collaborate with. Then through collaboration, the universal design can be put into place to help not only MLLs growths but all students in the room as well. However, in this world, most schools do not have enough funding or enough student count to recruit an ESL teacher into their building. Mainstream teachers should be the next ones who are able to step up because they have the skills needed. Courses and scaffoldings for MLLs should not only be taken by those who want to become an ELL teacher but should be an essential to all mainstream teachers. The future is changing every day; schools have more and more MLL students entering the education system compared to a couple years ago. Teachers, no matter what their specialty, should be able to have at least some of the skills to provide for their students. When these skills are obtained, not only will they help the MLLs in their classroom but every single one of their students will be influenced positively.
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