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Promoting a culture of student self-advocacy within secondary science classrooms

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PROMOTING A CULTURE OF STUDENT SELF-ADVOCACY

WITHIN SECONDARY SCIENCE CLASSROOMS

A Thesis Submitted

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Date   Dr. Jessica Moon, Director, University Honors Program

Introduction

The science classroom should be an environment where students feel confident to voice their opinions and educational needs, not an environment where they are discouraged from sharing their experiences and ideas. Recognizing self-advocacy in education means that we recognize the importance of students' role in their individual education. Students deserve to be taught in classrooms that encourage them to stand up for themselves and ask questions when they have educational goals they need help achieving. In order to promote self-advocacy in the classroom, the factors that impact self-advocacy should be explored. This study targets one of the most influential factors, self-efficacy. Lower levels of self-efficacy typically result in lower amounts of self-advocacy, and higher levels of self-efficacy result in higher amounts of self-advocacy.

The purpose of this study is to determine the greatest source of self-efficacy that exists among 5-12 students in science through a meta-analysis of three previous studies. After analyzing the collected data, teaching strategies that aim to boost the most influential source of self-efficacy for students are recommended and briefly discussed. Gaining a better understanding of the sources self-efficacy, along with how to support these sources will help science educators understand how to support student self-advocacy.

Literature Review

What is Self-Advocacy?

While it is important for a teacher to believe a student should have a choice in their learning, it is just as important for students to recognize their own educational needs and become self-advocates for those specific needs (Douglas, 2004). Students need to possess many non-

content-related skills to be successful in an educational setting, one being self-advocacy. Self-advocacy is centered around being able to determine one's specific learning needs and using the
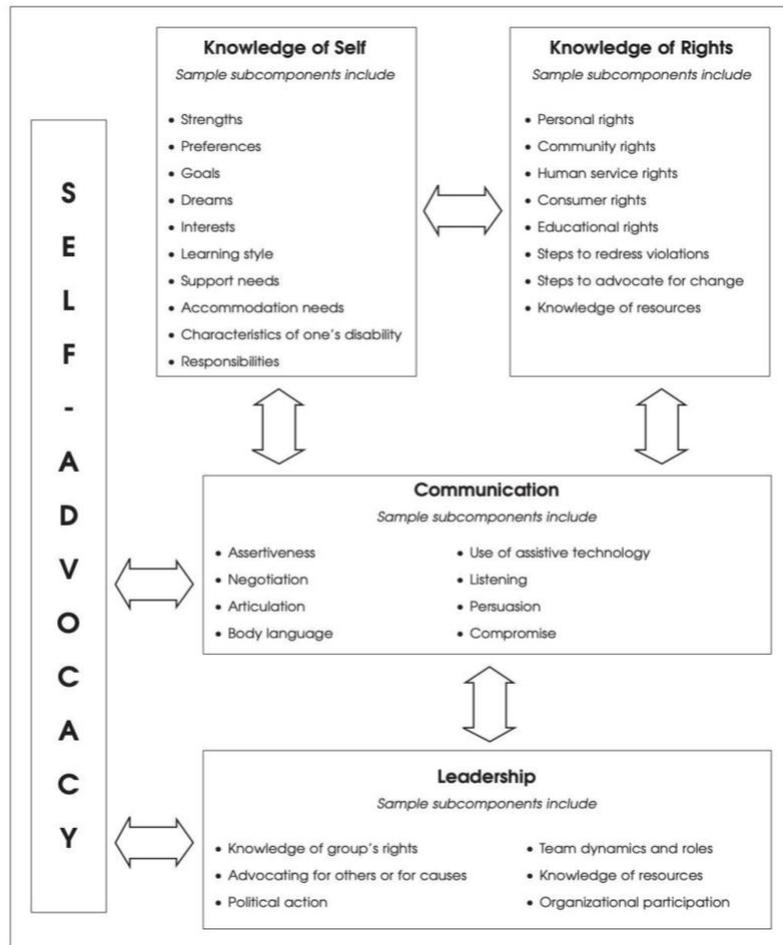
skills and resources to work towards attaining these needs. (Douglas, 2004). It has been also referred to as an individual's capacity to find, evaluate and use the information for one's benefit (Vessey, 1997). Many structural frameworks have been developed to explain the basic tenets of self-advocacy.

Figure 1. David W. Test's Conceptual Framework for Self-Advocacy

One specific researcher in the framework of self-advocacy is David W. Test. His work is centered around self-advocacy for special education but can be easily applied to all students. Figure 1 is a flowchart displaying the four components of Test's (2005) framework of self-advocacy: knowledge of self, knowledge of rights, communication, and leadership.

Demonstrating a knowledge of self would be observed as a student being aware of their educational strengths and weaknesses. A knowledge of rights concerns being informed of laws

and policies which exist to regulate accommodation processes (Test, 2005). Effective communication results in student behaviors that cultivate respectful, yet assertive, professional communication about their needs. Finally, leadership, which is not as essential to self-advocacy, involves collaboration and advocacy for group rights (Test, 2005). Douglas (2004) further expanded on Test's ideas, discussing the importance of students developing their learner profile. This would coincide with a student's knowledge of self, as they would compile their educational strengths and weaknesses to create an accurate learner profile to help them effectively self-advocate.

Why is self-advocacy important for all students?

All students need instructional support for self-advocacy skills, and those skills are applicable at all grade levels. Students are aware of less than half of the differentiated learning experiences available to them (Douglas, 2004). Most current research tends to focus on the instructional methods to apply self-advocacy skills within special education classrooms. While self-advocacy plays an essential role in the success of special education students, gifted students need just as much education in self-advocacy. Gifted students often struggle with self-advocacy for two primary reasons. One, educators do not realize that gifted students also need special programming, just as special education students do (Douglas, 2004). Many schools do not have a concrete gifted program available to students who demonstrate advanced abilities. Second, educators and society assume gifted programs in schools are only for those at the top of their grade level, leaving out those students whom are highly skilled learners (Douglas, 2004). While some of these advanced learners do not qualify to be enrolled in a gifted program, these students still require enrichment within a general education classroom. Students of all ability levels

benefit from self-advocacy instruction. Khalifa (2013) addressed the importance of self-advocacy skills within student groups at risk for ecological, behavioral, marginalization, or social reasons. Providing a framework also allows for educators to play an important role in helping students develop self-advocacy skills. School leaders have a profound impact on the development of self-advocacy skills in students, along with their families (Khalifa, 2013). The relationship between students and educators is essential to building a classroom community that encourages self-advocacy.

How does the potential for accumulation of self-advocacy skills change throughout adolescence?

The human body goes through a cycle of changes as it reaches the adolescent age. Vessey (1997) determined there are three types of factors impacting a changing adolescent self-advocacy: predisposing, modifying, and readiness. Of the three types of factors, predisposing factors are the most crucial in shaping self-advocacy. Predisposing factors include age, developmental level, socio-cultural orientation, and socioeconomic status, the two most important being age and developmental level (Vessey, 1997). Developmental stages associated with various age levels can directly apply to observed changes in self-advocacy abilities. At approximately age 11-14, children begin to shift from a dependence on adults to independence. This change is associated with mood swings and disruption of relationships (Vessey, 1997). Observable behaviors in a classroom might involve more outspoken students arguing about different features of the classroom, such as assigned coursework or seating arrangements. When adolescents reach ages 15-17, they are better able to understand the cause and effect between current behaviors and future consequences (Vessey, 1997). Students would have to understand the relationship between the strategies they use to learn the material and how they can

demonstrate their learning, via performance tasks. Finally, during late adolescence, ages 18-20, students have been observed as having an increase in sophistication and emotional stability (Vessey, 1997). At this point, adolescents exhibit more consistent behaviors and have a more thorough understanding of abstract concepts. By this point, they would understand the importance of routines when it comes to educational benefits. For instance, completing class activities and homework has the benefit of allowing a student to practice their knowledge and skills for a later assessment.

The final two predisposing factors, socio-cultural orientation, and socioeconomic status impact the way adolescents approach situations in which they would need to self-advocate. Socio-cultural orientation is based on a students' learned ways of doing, feeling, and thinking, which is impacted by family, social groups, and religion. (Vessey, 1997). On the other hand, socioeconomic status impacts adolescents' sense of entitlement and their expectations surrounding accomplishments, educational or otherwise (Vessey, 1997). While not as impactful as age and developmental level, these two factors still play a role in the development of self-advocacy.

Modifying factors also impact how self-advocacy develops in adolescents. These factors include individualism and family environment (Vessey, 1997). Individualism deals with maturity based on experiences. Typically, adolescents that have mastered physical, intellectual, social, and emotional tasks representative of their age level will be more likely to engage in self-advocacy (Vessey, 1997). Those who have completed these tasks feel more confident in their abilities and tend to pursue further tasks. Family environment, specifically parent involvement also impacts self-advocacy. The control parents and guardians allow their children to have when it comes to decision-making impacts self-advocacy development (Vessey, 1997). If adolescents are raised in

a household where they have very little opportunity to provide their opinion, they will continue to rely heavily on adult opinion and avoid opportunities to self-advocate. It could also be inferred that the family environment also impacts the number of age-level tasks adolescents master independently.

The final type of factors impacting self-advocacy development are readiness factors. The most prominent readiness factor is motivation, both intrinsic and extrinsic, as it causes a change in adolescent behavior (Vessey, 1997). Extrinsic motivation is driven by external rewards, such as good grades. On the other hand, intrinsic motivation is driven by personal rewards, such as enjoyment from completing a task. Vessey (1997) explained positive changes to self-advocacy development are more long-lasting when impacted by intrinsic motivating factors. The personal benefit reaped from taking control of one's decision has a greater impact than receiving the praise of others.

What is Self-Efficacy?

An important part of developing strong self-advocacy skills is addressing the matter of self-efficacy. According to Albert Bandura (1997), self-efficacy is defined as one's beliefs in their capabilities that would allow them to follow the desired course of action in a given situation. If an individual experiences an increase in self-efficacy, they will be more likely to advocate for their needs, educational or otherwise.

Self-efficacy is determined by four individual factors. The first factor is mastery experiences, which are also known as past performances, and is acknowledged as the most influential of the four factors (Bandura, 1997). An example of this might be a poor test score, which causes a student to think poorly of their skills in that specific subject area. One study

determined mastery experiences had the greatest impact on the self-efficacy of male students (Webb-Williams, 2017). Males tended to draw more from the successes, downplay their failures, and therefore are more confident when approaching new academic challenges. Female students tend to underestimate their abilities when self-assessing and often focus on the failures instead of the successes (Webb-Williams, 2017). Since females tend to underestimate their abilities this may affect results of studies where females self-report about academic experiences related to self-efficacy.

Bandura's (1997) second factor of self-efficacy is vicarious experiences. These are experiences that involve observing and assessing the performance of peers. A vicarious experience might be observing you got a higher test score on a test than a peer, which likely increases your self-efficacy as you believe that you are more intelligent. In the same study conducted by Webb-Williams (2017), it was found that vicarious experiences had the greatest impact on female self-efficacy. Possibly due to differences in social interactions with peers, survey responses tended to follow a trend of including statements that discussed a change in personal feelings after observing differences in the performance results of peers.

Verbal persuasion is the third factor impacting self-efficacy. Bandura (1997) described verbal persuasion as the need for one to receive verbal feedback on performance. An example of this would be a student receiving specific negative feedback about presentation skills. From this interaction, a student's self-efficacy would most likely decrease because they now also believe an adult does not have confidence in their abilities. Positive feedback is linked with an increase in student self-efficacy but can be ineffective in students developing a healthy self-efficacy if used too often or if it is too positive (Webb-Williams, 2017). Trends in how teachers publicly disperse feedback also impact student self-efficacy. In preliminary research, Webb-Williams

(2017) determined that varying treatment of male and female students influences the development of student self-efficacy. This could also be applied to students of different socioeconomic statuses or students with different learning challenges. If a teacher tends to only provide positive feedback to a specific group of students in front of the entire class, students will start to believe the teacher is only confident in the abilities of those students.

The fourth and final factor impacting self-efficacy is a person's physiological state. This factor can be described as the moods, fatigue levels, and anxiety levels of an individual (Bandura, 1997). If a student were to be stressed with other classwork, family circumstances, or work situations, they would have less confidence in their educational abilities. While it does stand on its own as a factor in an individual's self-efficacy, Webb-Williams (2017) determined an individual's physiological state played more of an interconnected role in self-efficacy along with the other factors. Physiological states can be brought on by other factors of self-efficacy, such as a more positive mood when receiving a good grade.

Why does self-efficacy matter?

Self-efficacy is one of many aspects of an individual's self-system. It influences the goals we determine and pursue, along with the decisions we make (Caraway, 2003; Webb-Williams, 2017). Specifically in education, self-efficacy impacts the actions students take to shape their education. Students often base their educational decisions on their self-assessments of self-efficacy, choosing and pursuing educational pathways where they believe they can succeed. (Webb-Williams, 2017). Students with higher levels of self-efficacy have multiple pathways allowing them to conquer continual challenges. Students with lower levels of self-efficacy see few if any pathways that align with their passions. For instance, a student may be passionate

about STEM topics, but low self-efficacy could push them to pursue a road that does not involve STEM to preserve self-image.

Engagement in school environments is also impacted by self-efficacy. Caraway (2003) found that students who exhibited sustained effort, and persistence have more engagement in school. High levels of self-efficacy promote behaviors that push students to pursue opportunities for involvement. When we have a greater belief in our educational abilities, we put more effort into pursuing the goals we originally set for ourselves and are more likely to stick to our goals. Due to an increase in school engagement, students in turn experience desired scholastic outcomes, as described by Jansen (2014). Not only does self-efficacy strengthen a student's self-system, but it also allows students to have a deeper engagement with educational opportunities provided to them.

Self-Advocacy in Science Classrooms

Much of current research focuses on how self-advocacy and self-efficacy affect student performance in school. Performance is often determined as achievement on standardized tests as students develop, rather than how students achieve outside of testing measures within the classroom. This is an issue because standardized tests tend to be a greater measure of test-taking skills rather than content knowledge or ability to apply knowledge.

Instead of focusing on student performance related to memorization, science curriculum should prioritize opportunities for students to apply the knowledge and skills they learn throughout the class. The Next Generation Science Standards (NGSS) help frame science education in a more action-based way, than just simply understanding a concept. Standards provided by this framework are focused on student actions such as: asking, defining, developing,

applying, planning, analyzing, interpreting, constructing, designing, evaluating, communicating, and engaging (Next Generation Science Standards, 2021). These skills are important for students to learn and practice because they can be applied outside of the science field. All students will benefit from learning science-based skills, no matter what their future entails.

Research Question

What is the greatest source of self-efficacy for 5-12 students in science classrooms?

By determining the greatest source of self-efficacy among students in science classrooms, educators can be better prepared to implement instructional strategies that boost these specific sources of self-efficacy, in order to promote self-advocacy among students.
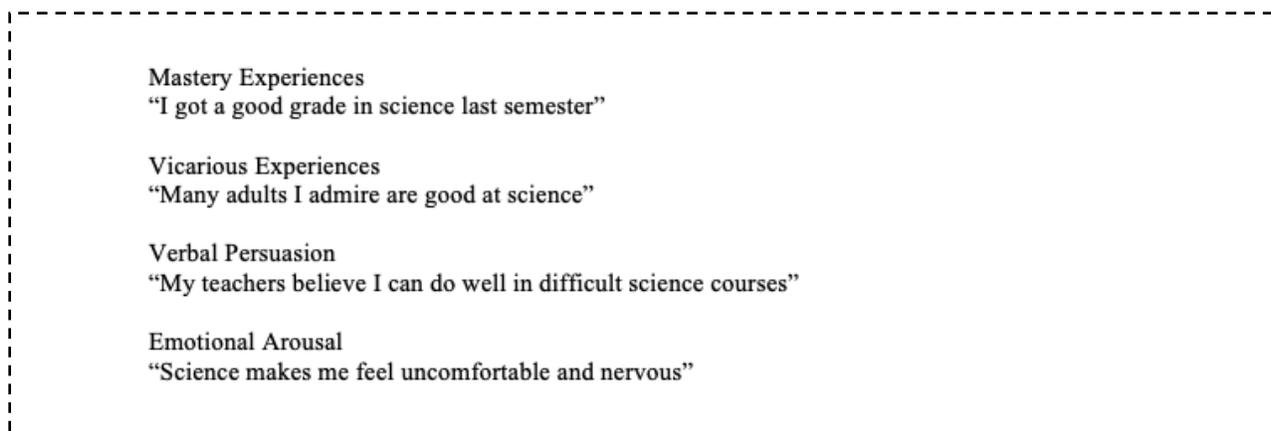
Methodology

Articles used for Meta-analysis

Three research articles were used in this meta-analysis as sources of data. The first article, published by Britner in 2008, was entitled "Motivation in high school science students: A comparison of gender differences in life, physical, and earth science classes." Britner (2008) had a sample size of 502 students, grades 9-12, from a public high school in a small Midwestern city. This high school offered a variety of science classes, including life science, physical science, and earth science. The second article included in this meta-analysis was entitled, "Sources of Science Self-Efficacy Beliefs of Middle School Students", published by Britner & Pajares in 2006. Their study had a sample size of 319 students, ranging from grades 5-8, from a public middle school in a small Midwestern city (Britner & Pajares, 2006). The third and final article, published by Kiran and Sungar in 2011, was entitled, "Middle School Students' Science Self-Efficacy and Its

Sources: Examination of Gender Difference." This study had a sample of 1932 8th grade

students from 21 public middle schools in an urban setting. Between all three studies, this brings

the overall sample size of the meta-analysis to 2740 students, ranging from grades 5-12.

Data Collection Instrument

The three studies described above were chosen for this meta-analysis because they all

used the same data collection tools, the *Sources of Self-Efficacy Scale (SSES)*. This scale was

originally developed by Lent et al. (1991) and questions were constructed through guidance from

Bandura's social cognitive theory (Britner, 2008). Questions given from this scale are assessed

on a 6-point Likert scale, an approach to collecting scaled responses in a survey (Britner, 2008;

Britner & Pajares, 2006; Kiran & Sungar, 2011). With this scale, students scored how a specific

statement related to self-efficacy reflected their experiences in science. Figure 2 gives examples

Mastery Experiences
"I got a good grade in science last semester"

Vicarious Experiences
"Many adults I admire are good at science"

Verbal Persuasion
"My teachers believe I can do well in difficult science courses"

Emotional Arousal
"Science makes me feel uncomfortable and nervous"

of statements used for the four different factors of self-efficacy.

Figure 2. Sample statements from Sources of Science Self-Efficacy Scale

According to all three studies, higher scores for the first three categories were documented as a

reflection of these categories being the source of students' self-efficacy (Britner, 2008; Britner &

Pajares, 2006). Emotional arousal was reverse-coded, meaning that higher scores in the

emotional arousal category coincide with lower levels of anxiety and stress related to science (Britner, 2008; Britner & Pajares, 2006).

Data Analysis

Data was separated by male and female students to determine any trends that may exist due to a gender difference. Weighted mean and standard deviation were calculated for each of the following categories: mastery experiences, vicarious experiences, verbal persuasions, and emotional arousal. A graph was also created as a visual representation of the possible differences that occurred between the sources of self-efficacy between male and female students.

Results & Discussion

Sources of Self-Efficacy

Analysis of the data revealed no significant differences between male and female students in mean scores for each category, as revealed in the graph (Figure 3).
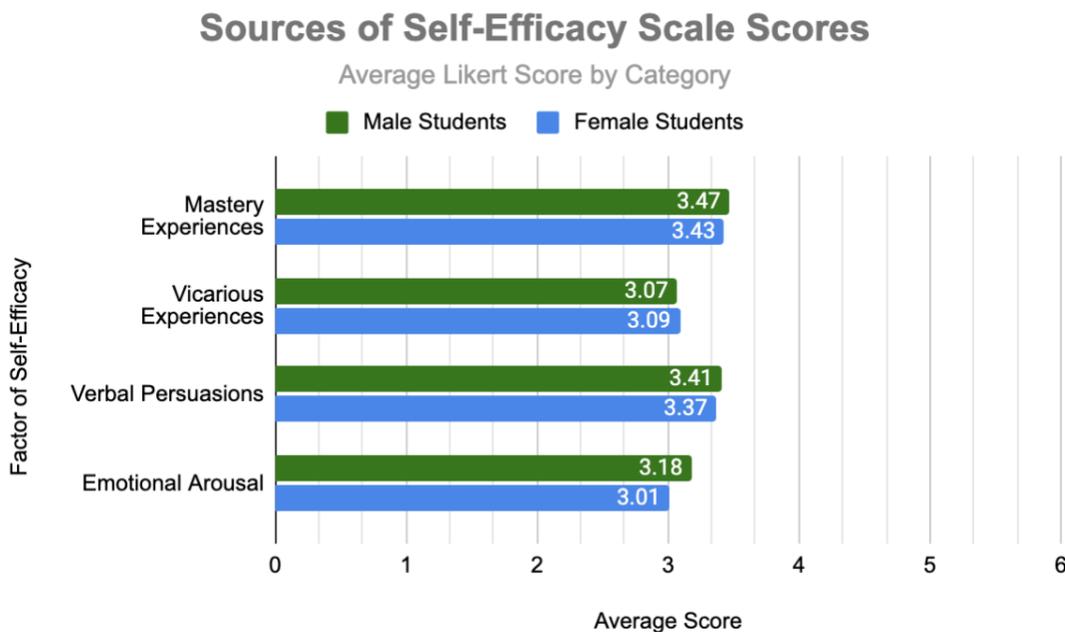

Sources of Self-Efficacy Scale Scores

Average Likert Score by Category

■ Male Students   ■ Female Students

Factor of Self-Efficacy	Male Students	Female Students
Mastery Experiences	3.47	3.43
Vicarious Experiences	3.07	3.09
Verbal Persuasions	3.41	3.37
Emotional Arousal	3.18	3.01

Figure 3. Graph of Sources of Self-Efficacy Scale Scores

The largest difference in scores occurs in the emotional arousal category, where male students had an average score of 3.18 and female students had an average score of 3.01. With a slightly higher score, this means that male students typically face less anxiety and stress concerning science than female students.

Overall, the highest sources of self-efficacy for students were mastery experiences and verbal persuasions, as shown in Figure 4. Male students had an average score of 3.47 for mastery experiences and 3.41 for verbal persuasions. Female students had an average score of 3.43 for mastery experiences and 3.37 for verbal persuasions.

Source of Self-Efficacy	Male Students		Female Students	
	Average Score	*Standard Deviation*	*Average Score*	*Standard Deviation*
Mastery Experiences	3.47	0.37	3.43	0.26
Vicarious Experiences	3.07	0.14	3.09	0.17
Verbal Persuasions	3.41	0.19	3.37	0.18
Emotional Arousal	3.18	0.41	3.01	0.34

Figure 4. Table of Mean Scores by Gender for Sources of Self-Efficacy in Science

What do these results mean for self-advocacy for all students?

In order to promote self-advocacy, teachers must address the greatest sources of self-efficacy among students, mastery experiences and verbal persuasions. One approach would be to use instructional strategies to boost these sources. By giving students more opportunities to have positive experiences related to mastery experiences and verbal persuasions, teachers help positively influence self-efficacy, and in turn self-advocacy for all students.

To address mastery experiences, one recommended instructional strategy is personalized learning. Personalized learning focuses pacing instruction based on student learning needs, preferences, and interests (Bray & McClaskey, 2015). Students are given more control over their learning experiences, allowing for a shift from teacher-centered to student-driven classroom activities. Student self-efficacy and self-advocacy are supported by this instructional strategy because it allows students to play an active role in their learning process within the classroom. Bray and McClaskey stated, "When learners have a voice in how they learn and a choice in how they engage with content and express what they know, they are more motivated to want to learn and own their learning" (2017). Personalized learning allows for students to have a role in creating more positive experiences within the classroom, which will give them more positive experiences to reflect on, which boosts their self-efficacy in terms of mastery experiences. This increase in self-efficacy leads students to be more outspoken about their learning journey within the classroom, advocating for what they need to have the best learning experience.

Personalized learning supports all types of learners in the classroom because it centers on each student's learning journey and allows for the teacher to meet the learning needs of all students. Teachers that provide numerous ways for students to learn and demonstrate their knowledge allow students to make individualized decisions about their learning process. Students that need more structured support have resources available to them, but students also have the gift of flexibility to adjust their learning experiences. Personalized learning also serves to allow for students to discover and research possible connections to classroom content that relate to their interests.

To address verbal persuasions, one recommended instructional strategy would be effective questioning methods. Asking effective questions is a part of a teacher's interaction

patterns. This interaction pattern consists of the initial question the teacher asks, the amount of wait time the teacher takes before calling on a student to answer the question, the student response, and then the amount of wait time that the teacher allows before responding to the student's idea (Olson, 2008). Students are able to gain confidence in their content knowledge through the cycle of questions asked, especially if these questions are thought-provoking, rather than dichotomous. Emphasis is put on these types of questions because they push learners to think about the scientific phenomena rather than rote memorization of facts.

Implementing an effective wait time allows for students to have a greater amount of time to construct their responses, which results in a more in-depth explanation of their understanding of the material. Aside from a longer wait time, asking for elaboration of student ideas allows for all students to be continually engaged, as they may have something to add to the conversation after their peer has finished elaborating. When students hear confirmation of a peer's idea, they are not as likely to share because they do not think there is another possible correct answer to the question.

This strategy plays into student self-efficacy and self-advocacy as it helps students avoid a fear of rejection or being incorrect. Starting with simple questions allows students to build confidence in their abilities. Without an effective questioning method via teacher interaction patterns, student self-efficacy would struggle because students start to have less belief in their original ideas and are only set out to please the teacher with the specific, correct answer. This loss of self-efficacy, in turn, diminishes the level of self-advocacy in students. Students are less likely to ask questions or be involved in class discussions when they fear they may be wrong. Successful implementation of teacher interaction patterns allows for students to have a stronger voice in the classroom.

Effective questioning through teacher interaction patterns supports all learners because it allows for the teacher to differentiate interactions with their students based on the level of their content knowledge. As stated earlier, effective questioning methods allow for a teacher to determine the level of student understanding in a matter of seconds. If a student is struggling to understand the concept, the teacher could ask questions that help the student reach the intended level of understanding through their own observation and discovery. Likewise, for a student that has a more complex understanding of the concept, the teacher can ask higher-level questions that ask the student to use critical thinking skills to solve a possible problem or apply their understanding to a new concept.

Limitations

There are two types of bias that could have potentially occurred in this study, dealing with the original collection of data in the studies used in the meta-analysis. The first type of bias would be social desirability bias. This type of bias deals with the possible overreporting of desirable attitudes and the underreporting of undesirable attitudes. While engaging with the *Sources of Science Self-Efficacy Scale*, students may have felt indirect pressure to give certain answers to reflect what they thought they wanted their teachers or the researchers of the study to see. The other possible source of bias in this study would be actor-observer bias, where participants in the study attribute their actions to external factors, while they attribute other's action to internal factors. In the realm of this study, this bias would apply if students over-exaggerated the impact that external influences had on their self-efficacy in science. Even though there are external factors that play into one's self-efficacy, not everything impacting self-efficacy can be attributed to outside sources.

Conclusion

All students deserve a classroom environment where they feel they have a voice in their learning experiences. In order to promote a culture of self-advocacy in the classroom, teachers must address the factors that impact self-advocacy. One of those factors is self-efficacy, or one's belief in their capabilities in a given situation. The purpose of this study was to determine the greatest source of self-efficacy among students in secondary science classrooms and to recommend teaching strategies to address the greatest sources of self-efficacy that exist. Meta-analysis of previous studies using the *Sources of Science Self-Efficacy Scale* found that the greatest sources of self-efficacy among students in science were mastery experiences and verbal persuasion. Using teaching strategies that support these sources of self-efficacy is a way that teachers can indirectly influence student self-efficacy in a positive manner, resulting in a classroom culture that promotes student self-advocacy.

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