STEPHANIE MAH

WISE GIRLS

a STEM self efficacy toolkit for teachers + mentors

Everything you need know about running a STEM workshop for school aged girls

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Introduction

GIRLS IN STEM: ADVANCING THE FUTURE

Whether it's in school, media, extra-curriculars, or everyday life, it is so extremely important for young kids, especially girls (and of minority races), to see themselves in others. To be able to say "if she can do it, I can do it". We not only get to see others that look like us being successful, but we know that there is room for us in whatever field we wish to pursue. This toolkit is a nod to my own personal experiences growing up as a girl of the BIPOC community, as well as my struggles to see myself in other successful individuals. I hope this toolkit, if any, can help just one little girl out there and inspire her to know that she is capable of anything and no dream is too big. If you can see it, you can be it.

RATIONALE

The purpose of this toolkit is to provide accessible opportunities for young girls to build positive self efficacy, specifically when it comes to STEM and leadership. It will allow for teachers, mentors, and anyone working with youth to understand just what exactly self efficacy is, how it is formed, and suggested workshops that can be done to help provide these opportunities to young girls.

Key Terms

→ SELF EFFICACY: WHAT IS IT?

Self Efficacy is “the variation in beliefs about what one can and cannot do in certain conditions” (Hoyle, 2010, p. 13). These are developed through specific behaviors as well as arise from direct and indirect experiences with the given behavior. Through this, one develops their modes of self regulation, and their perception on their ability to carry out and produce certain attainments. This notion of self regulation begins when we are infants, through the development of rudimentary abilities such as awareness of cause and effect relationships.

Self Efficacy can manifest in many different types, but the ones this toolkit will be focusing on are Leadership Self Efficacy and Academic Self Efficacy (specifically in STEM).

→ WHAT AFFECTS SELF EFFICACY?

Self efficacy beliefs are dependent on 4 major sources; being performance mastery, vicarious experiences, verbal persuasion, and physiological and affective arousal (Bandura, 2012).

Performance mastery holds the strongest influence on self efficacy beliefs, and has to do with our previous experiences and their outcomes. Further, this means our achievements or our failures. If we fail, this can diminish our self efficacy, and if we succeed it can heighten it.

Vicarious experiences concern itself with what we think others' perceptions of us are, and how this affects expectations for our own behavior. A major example of a vicarious experience is having access to role models.

Verbal persuasion is the power that others hold over discussing our abilities and our probabilities of success. The power and influence that one's view of this has on us is dependent on their expertise, trustworthiness, and attractiveness. An example of this would be the feedback we get on our performance.

Physiological and emotional arousal has to do with the emotions we associate different performances or behaviors with. An example of this could be, if we associate success with pleasant emotions, or failure with unpleasant emotions. Anxiety plays a large role in this factor as it is likely to decrease one's confidence when trying to effectively perform a task or show an ability (Hoyle, 2010).

→ LEADERSHIP SELF EFFICACY

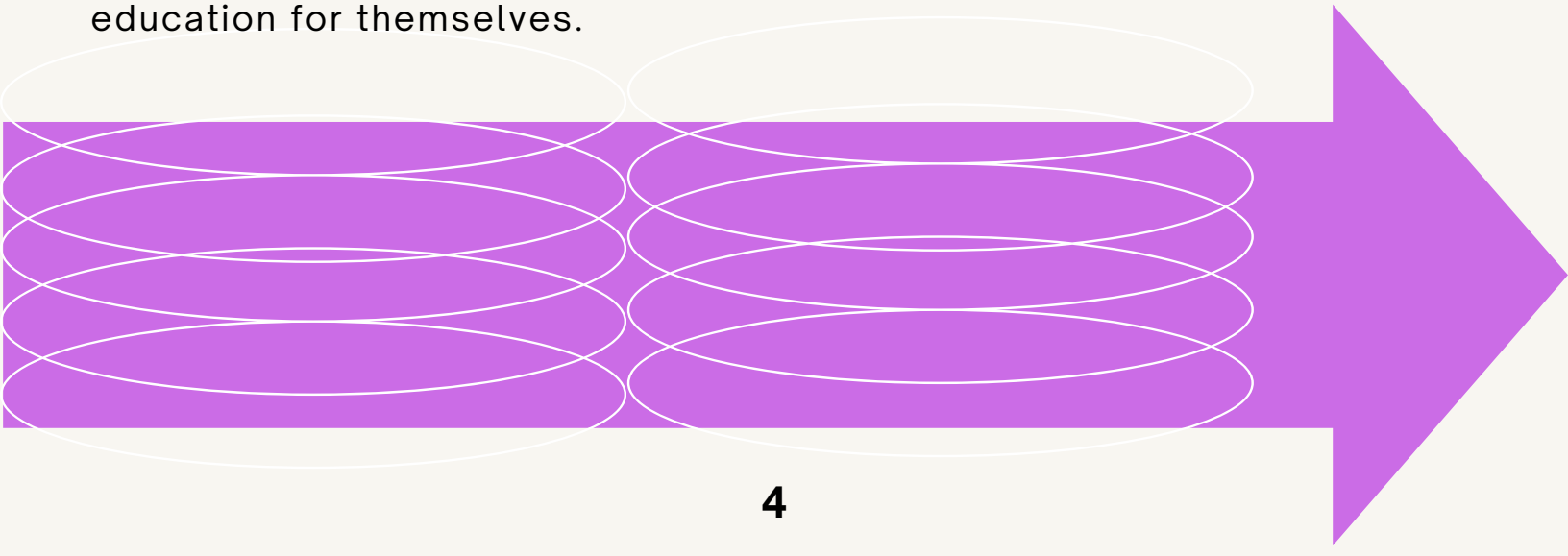
Leadership Self Efficacy is one's beliefs in their own ability, knowledge, and skills in leading others effectively. It affects how we develop and perform as leaders, and can also be described as the "confidence in your ability to excel in leadership positions in the workplace" (Hannah et al, 2008). The development of this kind of self efficacy in childhood, influences into adulthood.

→ ACADEMIC SELF EFFICACY

This is essentially taking self efficacy, and applying it to academics. It is the self efficacy that concerns a students regulation of learning and mastery, as well as is central to personal agency since it concerns itself with one's belief in his or her own capabilities. It reflects an adolescents level of confidence or belief that they can successfully accomplish educational assignments and tasks. Further, it is one's own confidence in their ability to exert control over one's own motivation, behavior, and social environment. Students with higher self efficacy beliefs in a learning task and performing it successfully are more likely to be engaged, whereas students with a lower self efficacy avoid the task. Academic self efficacy affects individual development and adaptation and has a direct effect on educational progress and success (Bondy et al, 2017).

Drop-Out rates and Educational Progress

Academic self efficacy is a fundamental factor in educational progress and success, as students with a higher academic self efficacy are less likely to drop out of school. This facilitates educational progress, and can be used as an indicator of the degree of engagement, belief, and perseverance a student has for a given task (Alivernini and Lucidi, 2011). It can impact career aspirations and pursuits, as well as affects pro-social conduct (Bondy et al, 2017). Research has shown that "a higher academic self efficacy leads to more self control, stress avoidance, continuing into higher education and greater effort and persistence in one's academic work" (Bondy et al, 2017, 489). This has a direct link to a student's decision on whether or not to pursue higher education for themselves.



The Significance of Self Efficacy

AT PLAY IN THE WORKFORCE

It is important to note that women face additional institutional barriers and gender inequities that can directly change the trajectory of their life. Their experiences however are all still unique, and racial and ethnic background have a major influence on this.

Scientifically Based Research

Just 6.4% of CEO leadership positions in the U.S in 2022 were held by women, and 8.2% of employees at fortune 500 companies were women. Of this 6.4%, just 1.2% were women of color. In other words, just 6 women of color held CEO leadership positions in the U.S alone in 2022. (Ruggs et al, 2023).

Even though the gender split in the workplace in Canada is equal, there is still a low percentage of women working in STEM. According to 2016 Stats Canada, 37.5% of men with Bachelors degrees are in a STEM area, and 52% of them are in engineering. When looking at women in Canada, 15.3% of them have Bachelor degrees but just 25.4% of this is in engineering. 62% of the women had biology degrees, and 30% physics (Pereault et al, 2018).

LOOKING FURTHER

It is evident here, that women in leadership positions are minimal, and women of color in these positions are almost non existent when compared to white women in these positions. There is a clear lack of role models for young girls, directly affecting their self efficacy. Not only is the STEM workplace male dominated, but it is reinforced by toys, clothing, and the voices and images being portrayed in media. The intersection of identities such as race and gender have an impact on girls/women's leadership self efficacy across their lifetime. This shows how societal-level and organizational-level factors drive individual-level processes.

A LOOK AT RACE

We can look at specific studies to show the varying life experiences women face. This study delves into the experiences of Black, Asian, and Latina women, uncovering significant variations in their upbringing and opportunities for self-efficacy development (Ruggs et al, 2012).

Black women, while receiving positive verbal persuasion from parents, face a lack of performance mastery and vicarious experiences, compounded by disciplinary biases and institutional neglect.

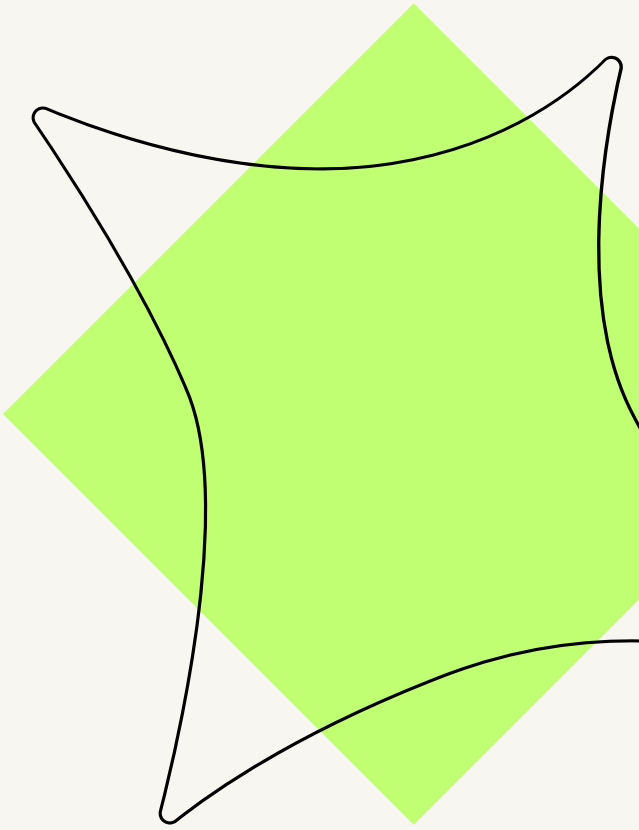
Asian women, on the other hand, are faced with parental pressures to conform to gender norms and excel in STEM fields, yet grapple with stereotypes undermining their leadership potential and encountering discrimination from both within and outside their racial group.

Latinas confront a convergence of traditional gender and racial stereotypes, limiting their access to diverse experiences and mentorship opportunities, worsening stress and hindering their leadership self-efficacy development. The lack of representation in senior positions strengthens these challenges, perpetuating cycles of inequality and altering empowerment.

Intersections

RACE AND IDENTITY

It is clear that race and gender intersect largely to have an effect on one's leadership self efficacy. Women in general are given less leadership opportunities, and women of color are given even less. Specifically, the lack of mentors for all racialized groups of women is detrimental as same race or gender mentors are the most rewarding type of success. All these barriers play a huge role in the development of leadership self efficacy, and self efficacy beliefs in general.



Intersections

GIRLS and STEM

Looking further, Lytton and Romney found that girls have a lower self efficacy in math, physical sciences, and male dominated areas (1991). They were also found to be more responsible and nurturing than boys, in all cultures, as well as showed more competency in jobs such as social workers, or teachers. However, when girls attended presentations that emphasized altruistic values of scientific career, and presentations by female scientists, as well as did hands-on science activities, they were shown to have an increased science self efficacy as compared to girls that did not. When looking at an explanation for such discrepancies in science self efficacy between girls and boys, it can be said that girls and boys have different socialization between the two, as well as boys have more access to sources of self efficacy, such as the mastery performance and vicarious experiences listed above (Lytton and Romney, 1999). When we place increased altruistic value on science careers, girls' self efficacy directly goes up.

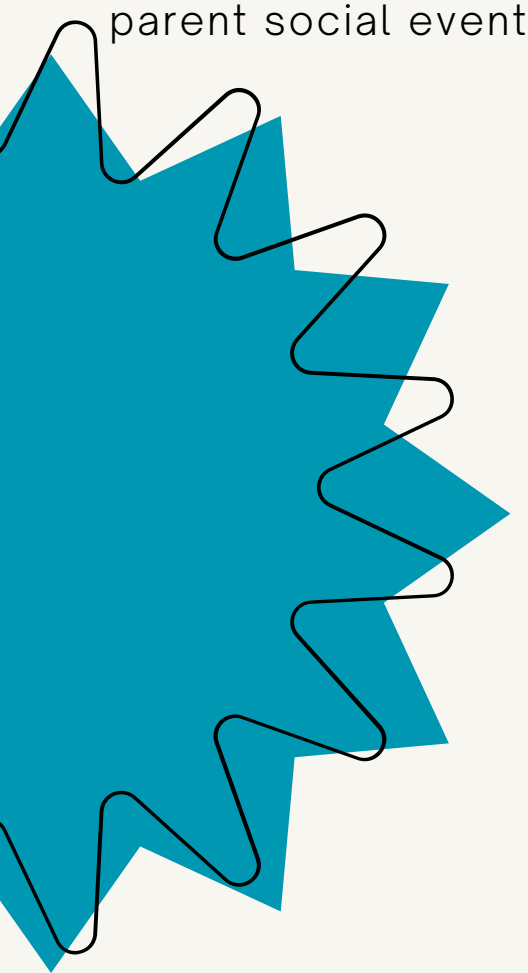
It is also important to note that girls' self-efficacy for regulated learning was seen to be mainly influenced by mastery experience and verbal persuasion (which they have been shown to continually lack access to), whereas for boys it was mastery experience, physiological and emotional arousal, and vicarious experiences. Thus, girls experience more stress, depression, and anxiety in science.

Fostering Beliefs

It is clear that fostering self efficacy beliefs in students, especially girls, and girls of color, must take into account a lot of factors and time. This starts from childhood, at home, and in the classroom. One way mentors can increase students' self efficacy (in science and in general), is by providing inquiry based science activities and scaffolding them. This provides a type of mastery experience, which is the most powerful source of self efficacy (Bandura, 2012). Teachers can also provide challenges to activities and give correcting feedback to students on their performance. This means providing opportunities to correct mistakes, as well as seeing themselves as part of their learning. Hence the phrase, "if you can see it, you can be it". In turn, students will be better able to realize associations between their efforts and their accomplishments. This is a form of mastery-oriented learning as well. Through stressing learning over the satisfaction of rewards, it reduces the prevalence of self limiting thoughts.

WISE Girls: The Workshop

The next section will be a proposed outline of an all girls STEM/WISE (Women in science and engineering) workshop that can be implemented in various environments such as the classroom, and extra-curricular clubs such as after school programs or summer camps. The idea of the workshop is to be girls only, and all the mentors be female as well. It includes a mini series of STEM activities that can be carried out in small groups, followed by a STEM career awareness and exploration and mentorship session, and then concluded with a student-parent social event to celebrate the workshop.



STEM ACTIVITY #1: TINFOIL SHIP BUILDING

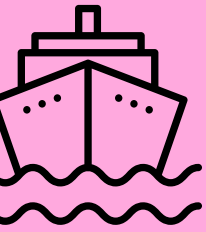
1 session, 2 hours

Subjects: Physical Sciences, Engineering
Technical Writing, Narrative Writing, Creative Writing

Overview: Ships capture imagination. We ship things from one place to another, as well as name the ships (Titanic). Students engage and exercise imagination in this workshop by building ships with some accessible materials. They also learn about density, a key principle in physics and chemistry, etc. Using new insights they can write tales of adventure and exploration on ships

Materials:

- Load materials for testing boats (such as laboratory weights, marbles, pennies, etc.)
- Atleast 1 container full of water (like a wading pool, a large plastic bin, a bucket, a cooler, or a sink)
- Copies of the “Shipbuilder’s Blueprint” handout (included with other handouts at the end of this lesson)
- Demonstration items
- Things that float (wine cork, piece of wood, glass baking dish)
- Things that sink (piece of metal, rock, solid piece of glass)
- Atleast 1 dilemma item (something that looks like it should sink or something that’s heavy but will still float, such as a pumice stone or a bag of ice, etc.)
- Aluminum foil cut into 12 by 12 inch sheets (several for each student, plus extra for demonstration)
- Copies of the “Captain’s Log: Shakedown Cruise” handout
- Copies of the “Captain’s Log: Shakedown Too” handout



Prep: In this workshop students build tinfoil boats and test their seaworthiness by weighting them with load material.

STEM ACTIVITY #1: TINFOIL SHIP BUILDING

Intro (10 mins): Using the "Shipbuilder's Blueprint" handout, ask students to imagine building a ship from any point in history. Have them describe the ship: What does it look like? What is it made of? Who and/or what will go in it? Where will it go and why? What are some of the challenges it might face on its journey? What are some of the design features of the vessel that make it uniquely suited for this journey? Have students write down a few ideas about their ship and the adventure it is about to embark on. Encourage them to include a lot of detail in their description. If time permits, they can sketch a quick picture.

Discussion (15 mins):

- What are some things that float?
- What are some things that don't float?

It will be useful at this point to bring out materials (some that float and some that don't), and some that look like they will sink, etc. Ask students to make predictions based on their prior knowledge of the items and/or the items' appearance. Test their predictions.

After testing, ask the question of

- "What makes something float?". This is where you can bring up density (how much mass/stuff is packed into a space of a particular size). Next ask
- " How do ships, which are really, really, really massive, float in water?

Shipbuilding (15 mins): Ask students to reflect on the ship they imagined at the start of the workshop. What are common features of the ships? What are some special features of particular ships that make them suited for specific tasks? What, exactly, is a ship?. Next, give them the challenge to build a ship that can carry weight and does not sink. You can take a piece of tinfoil and fold it many times then place it on the water to show that it sinks. Tell students this is where they will be making a ship out of this material and will have time later to refine their design, after testing. Students should be thoughtful about their design, but also attentive to time so they are able to test, refine, and test again.

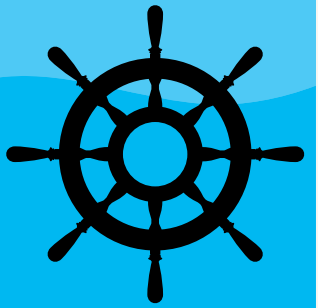
STEM ACTIVITY #1: TINFOIL SHIP BUILDING

Station 1: Shakedown Cruise (testing and observation, 15 mins): as students start finishing get them to test their first draft at the testing station. Based on the basic definition their ship will be a success if it floats, and can carry weight. As a bonus, it could be a success if it moves (can tie a string to the prow and pull gently), or it can turn while being loaded without flipping over or taking on water

Station 2: Captain's Log (documentation, 10 mins): after testing students can document their ships success and failures using the captain's log shakedown cruise handout. Emphasize the more specific they are, the better they can refine their design.

Station 3: Shipbuilding, Again! (15 mins): Students have now seen density in action, they are tasked to improve the original design. If their ship sank or flipped, how can they prevent this? If the ship passed the first test, how can they improve it so it can carry more weight or sail more quickly or smoothly?

- Questions students can ask themselves:
  - Did the density of your ship change during the test (leaks or hull deformation)?Are some parts of your ship more or less dense than others? (this can cause a ship to lean or sink)
  - Is it possible to change the density of your ship?
  - What about the density of certain parts of your ship?
  - How does adding cargo affect the density of your ship?



STEM ACTIVITY #1: TINFOIL SHIP BUILDING

Shakedown, Two (testing, observation, and documentation… again!, 15 mins): Have students each test their redesigned ship! Using the Captain's Log: Shakedown, Too", handout, and again moving through the testing, documentation, and refinement stations, students will document their tests as before; assess their design improvements, comparing their refined design to the original; and propose another round of design changes.

Letters in Bottles (25 mins): Students have seen ships in action now and should be better able to see how density works and how density changes affect ships.

- Ask them to recall the ship and the adventure they imagined at the beginning of the workshop.
- Ask them to think more about the ship's adventure and what they've learned from their experiments- and then to use all of that to write a story.

For example, about a submarine and the density changes dangerously and unexpectedly due to extra cargo, a leak, stowaways, etc. Their stories can take different forms, a captain's or crew members log, a letter to a friend or loved one, a message in a bottle to let its finder know a ships final fate.

Handout #1: SHIPBUILDER'S BLUEPRINT

Imagine what kind of ship you'd build if you were a shipbuilder. It can be from any time and from anywhere, even the future. It can be tiny, enormous, simple, ornate, practical, ridiculous; an old-timey pirate's galleon, a futuristic submarine, a kayak, a raft, a yacht, a cruise ship - anything that you want, as long as it floats (hopefully)

- What does your ship look like? Describe it
- What is your ship made out of?
- Who and what will go on your ship?
- Where will it sail, and why?
- What are some of the challenges it might face on its journey?
- What adventures might it encounter?

Now, draw your ship on the back of this sheet!

Handout #2: CAPTAIN'S LOG, SHAKEDOWN CRUISE

In this space, draw your first attempt at floating your ship. Draw it from the front and the side, being as specific as possible about

1. the location of any leaks
2. the orientation of your ship (that is, how upright it is or how much it leans over)
3. where the water comes up on the side of the ship (with measurements if possible)

Take lots of notes on what you observe after you've put your ship in the water.

Now, draw your ship under the load (that is, with weight). Again, draw it from the front and the side, and be specific about leak locations, your ship's orientation, and the water line.

Finally, draw your ship in motion, while continuing to pay attention to detail.

Handout #3: CAPTAIN'S LOG, SHAKEDOWN TOO

We hope you were able to improve your ship!

Here, document the differences between your original ship and your redesigned ship.

Again, record how your redesigned ship performs, making sure as always to be specific about leak locations, ship orientation, and the water line.

You'll probably have a number of different diagrams here - make sure to label them all appropriately.

Based on these results, how might you further improve your ship's design?

STEM ACTIVITY #2: MAKING ICECREAM

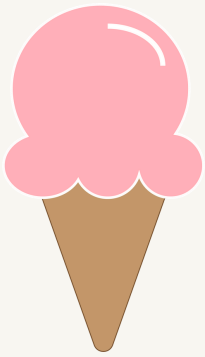
1 session, 1 hour

Subjects: Physical Sciences, Engineering, Chemistry
Technical Writing, Narrative Writing, Creative Writing

Overview: Making ice-cream is a great way to provide a hands on experience while indulging in STEM. Students engage and exercise imagination in this workshop by making ice-cream with accessible ingredients. They also learn about the science and technology of molecules, the 3 states, and other key principle in physics and chemistry, etc. Using new insights they can write reflect and collaborate with peers.

Materials (makes 1 recipe, multiply by number of groups):

- 1 Cup Half and Half Cream
- 2 Ziploc bags
- 2 tbsp. Sugar
- 1/2 tsp. Vanilla Extract
- 3 cups Ice
- 1/3 cup Salt



Prep: You may want to provide multimodal instructions by having a written page of instructions at each group station (with pictures for each step), as well as show a demonstration before the groups begin. Materials will be measured and set out at each station before lesson for each group by teacher to save time

Open Ended Discussion: By having an open-ended discussion about the change of state that they observe in the real world, learning starts in the “real world” (Heich, 2014). The connection to the “real world” will make learning to be more engaging and enjoyable (Martin, 2020). Prompting students to think about their favorite food’s change of state, makes it so that their “learning is personalized” by their interests (Heich, 2014).

STEM ACTIVITY #2: MAKING ICECREAM

Discussion Questions:

- What do scientist do- the more out there and/or the more relevant to everyday lift, the better. (ex. Figure out how to safe the honeybees and polar bears, designing robot, discovering new planets, making space suits, etc.).

- What's your favorite kind of ice-cream? What ingredients go into icecream? Is each ingredient a solid, liquid, or gas?

- What happens when we put any on of the solid ingredients (sugar, salt, ice) into a liquid like milk? (talk about it dissolving and how it is possible that we start with a liquid and end with a solid)

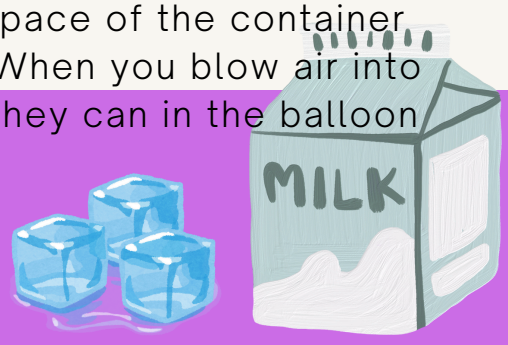
- Can you come up with 3 (or more) examples for each state of matter (liquid, solid, gas)?

- Think about your favourite meal or treat. Can you recognize any changes of matter that occur when making it? How do the ingredients change? Examples: cheese melts, egg hardens, water freezes, baking a cake

Have the kids discuss in their groups, then open up the discussion to the whole class, and ask for volunteers to share examples to the class that their group came up with

Teacher will then define 3 different states

- **Solid:** Things that are solid have fixed a volume and shape, like a table! It will not change its shape and will look the same even if it moves from one classroom to the other classroom.
- **Liquid:** Things that are liquid will follow the shape of the container like cream in the zip lock bag. We can change the shape of the zip lock bag and it will follow the shape of the zip lock bag
- **Gas:** Things that are gaseous will take up the space of the container as much as they can. Think about the balloon. When you blow air into the balloon, air will take up as much space as they can in the balloon



STEM ACTIVITY #2: MAKING ICECREAM

Teachers and students will choose 3 favorite foods. Teachers will ask students general questions about their favorite foods to explain and define 3 different states.

- Q: Group 1's favorite food is cheese. What is the state of cheese?
  - Give students the time to think and allow students to talk amongst the group to answer that question
  - Explanation for students: Cheese is solid when they come out of the fridge. However, when you put them in the hot oven, they melt and become liquid
- Q; Group 2's favorite food is eggs. What is the state of eggs?
  - Give student the time to think and allow students to talk amongst the group to answer that question
  - Explanation for students: The egg shell is hard when it is not cracked and it is solid. When you crack the egg and see egg white and yolk, they are runny like liquid. When you cook the egg, they harden to become solid again
- Group 3's favorite food is cake
  - Give student the time to think and allow students to talk amongst the group to answer that question
  - Explanation for students: When we make cake batter, they are runny and sticky and they fill up the cake pan. They are liquid! When we bake them in the hot oven, they become solid.

Talk about how there are many different foods with different states. Highlight how states can change from one state to another by showing a diagram (transition to the activity)

Using direct instruction for this lesson allows students to build their own knowledge efficiently and quickly while also effectively teaching skills and concepts to both high- and low-achieving students (Tunde & Listiani, 2021). Having students participating in their learning also benefits the overall learning outcomes (Stockard et al., 2018). Including a group discussion based on their personal opinions and facts, it not only increases classroom community and closeness, but also makes students feel seen and represented in the lessons they are taught (Jacobsen et al., 2013).

STEM ACTIVITY #2: MAKING ICECREAM

Describe activity aloud to students: “The ice cream we eat is solid, but we only have liquid here. To explore how states change from one state to another, we are going to make ice cream which is solid from the liquid ice cream.”

Define Rules:

- Make sure to wash your hands before and after the activity
- Be careful and be kind to other people around you
- Take turns and share
- If you spill anything or are in need of help, please let your teacher know
- Have FUN!

Define and demonstrate how to make ice cream before the class gets to try:

- First, Put half and half cream, sugar, and vanilla in a small ziploc bag
- Second, in a large ziploc bag put the salt and the ice
- Third, place the small ziploc bag in the large
- Last, instruct students to shake the bag until they observe a change in state

Students independently make their ice cream

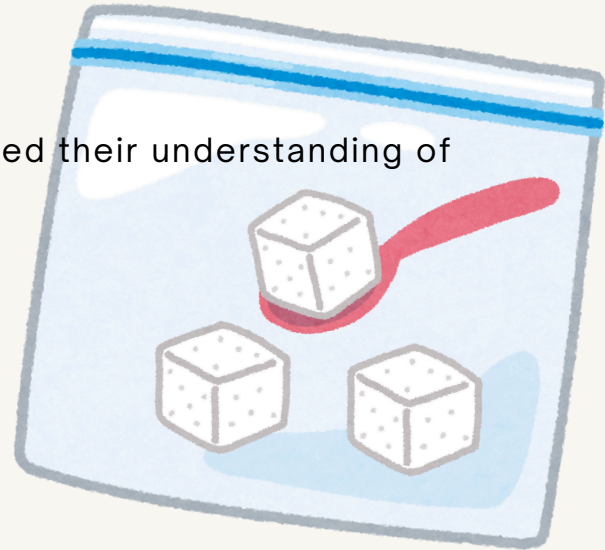
- Note: if there is a student with mobility difficulties, offer to help them/have their group members take turns helping

Annotations:

Hands-on activity of making the ice cream will give students the opportunity to solidify the concepts of change in states in different learning styles (Martin, 2020). Some students will solidify their knowledge by visually looking at the ice cream while some students will learn about change of state by touching the ice cream. Also, this hands-on exercise will make learning engaging and enjoyable by connecting their learning to the real world (Martin, 2020).

Reflection:

Have students reflect on how the activities changed their understanding of states of matter.



STEM ACTIVITY #2: MAKING ICECREAM

Summary and follow-up
Students will be in their groups, and we will have a class discussion for closing activity

Group Discussion
Students will go back to the groups discussion and write about keywords that stood out to them during the lesson. Then, they will come up with at least 1 question about the changes in states. They will write the key words and question(s) on the 11 by 17 paper the teacher provided.

Class discussion & Questions
Teachers will then collect all the group's questions papers and display it on the board. Teacher will facilitate the discussion by reading the questions out loud. In the group discussion, students will be able to raise their hands to answer questions or to ask a follow up question.

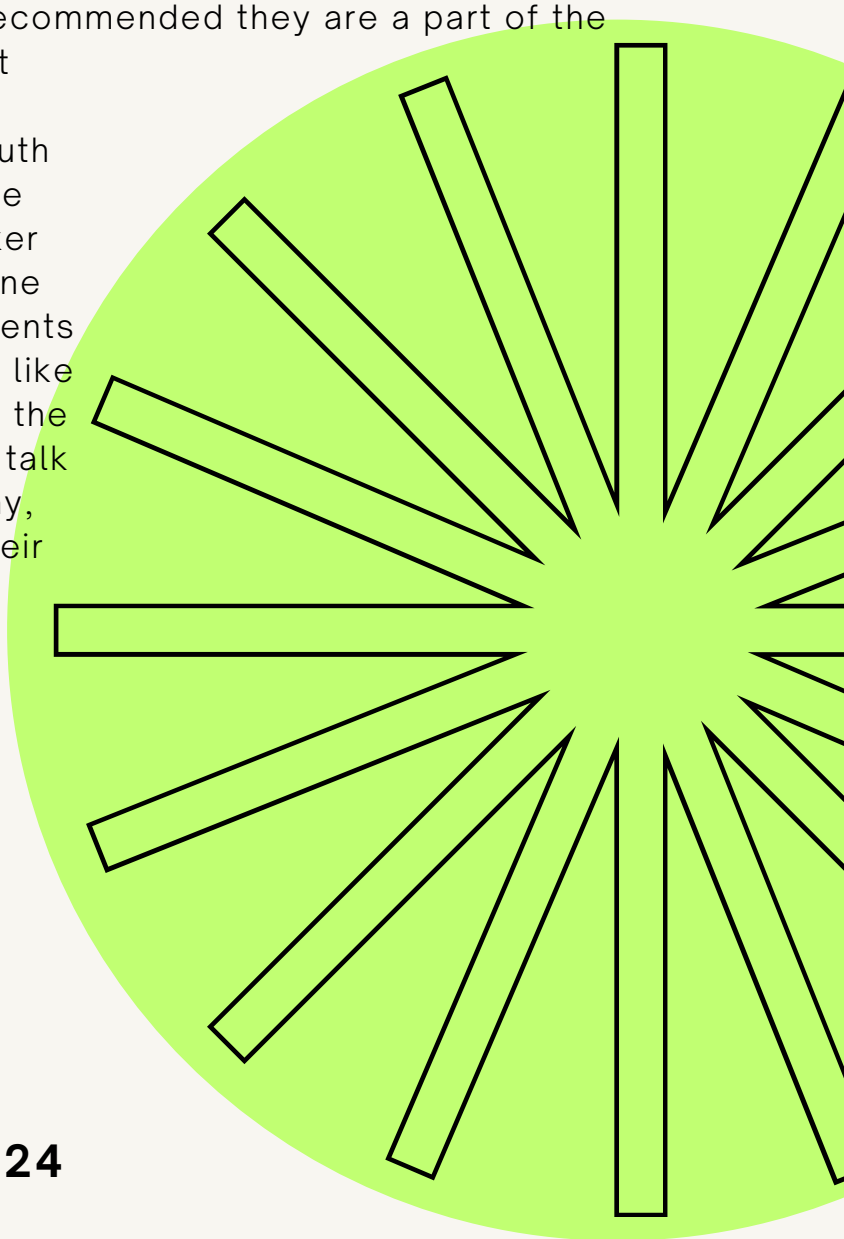
Optionally, students can complete an exit slip with the following questions

- What is something new you've learned about the states of matter
- What was the state you observed in each part of the procedure?
- Draw or write about your understanding about states of matter and how ice cream relates to this

Annotations:
We want students to come up with questions, answers, and follow up questions as we want to promote a learning environment that welcomes and values questions and student participation (Heich, 2014). Their behaviors will be praised to foster a learning environment, where students feel comfortable asking questions. We also wanted students to answer and ask questions to implement peer-to-peer instruction (Heich, 2014). The discussion is important as it allows for collaboration in the classroom. By having the students write down key words they are putting their general understanding into key concepts they understood.

STEM Career Awareness + Mentorship Session

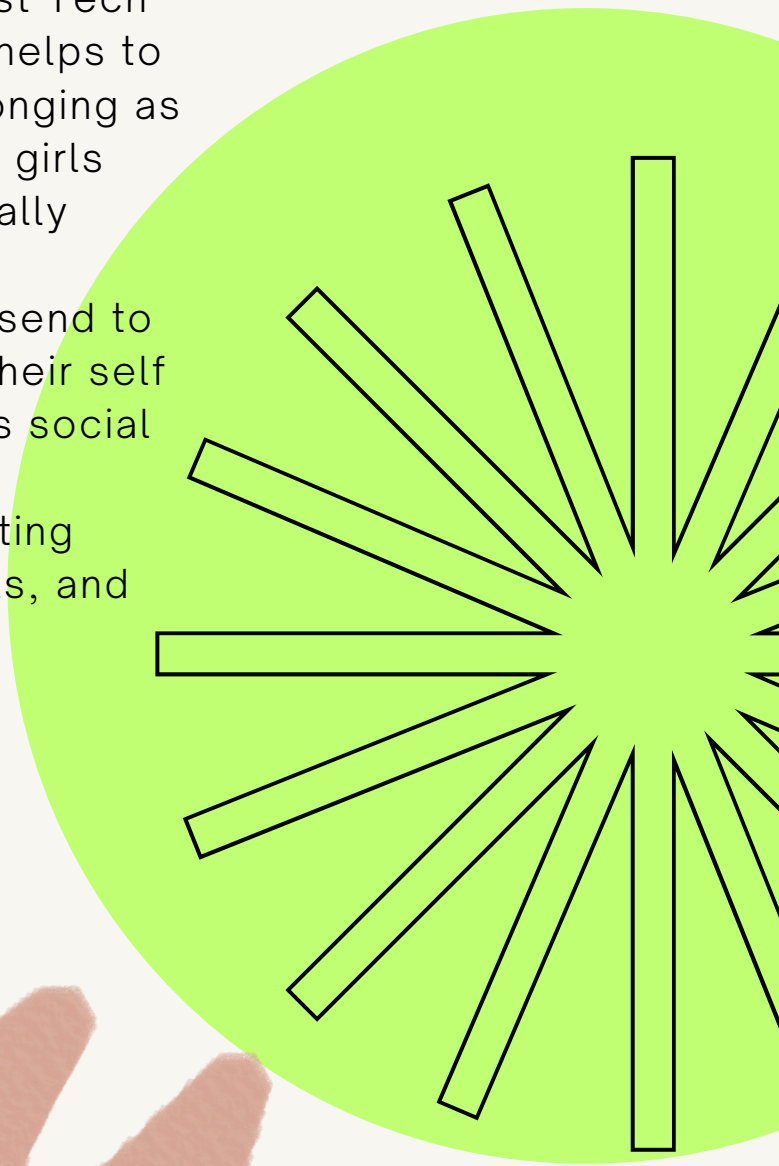
The next session in this workshop is a STEM career awareness + exploration session, as well as a mentorship session. This will give the girls a chance to connect with other females who are/were STEM college and university majors as well as professors. It is recommended that these mentors be recruited from the same geographical area that the workshop takes place, as well as it is highly recommended they are a part of the BIPOC group. It has been shown that students respond well to colleges/university students and youth speakers as they feel they can relate better (Blanchard, 2017). This speaker series can be done in person or online (via zoom or another platform). Students like hearing what the speakers were like at their own age. It is recommended the speaker/s has about 5-7 minutes to talk about their life, professional pathway, career, setbacks, a typical day in their life at their job, and answer any questions that the girls may have.



Having the mentorship series will also help the girls (and their parents) learn about educational requirements for a career, details about the career, and what they like and don't like about different STEM careers (Blanchard, 2017)

Parent-Daughter Social

At the end of the workshop, parents can be invited to come join their daughters in a social gathering. This could include snacks and drinks, as well as have relaxed music or activities for them to do. The girls will receive a certificate for their participation, and optional special awards such as “Most Tech Savy”, “Engineering Guru”, etc. This helps to promote a sense of comfort and belonging as well as lets the parents see what the girls have been working on. This is especially important, as noted before since the messages and expectations parents send to their daughters have a huge role on their self efficacy and career paths. Having this social event also allows the girls to build friendships, gain exposure to stimulating activities, learn new content and skills, and find what they are passionate about. (Blanchard, 2017)



Additional Support + Resources

TEXTBOOKS

Textbooks can be used as a powerful tool to help formulate self efficacy in students. Textbooks with more levels of diversity (sexual orientation, socioeconomic status, religion, culture, language, geography, body type and size, political affiliation, etc.) and positive/empowering images, lead to greater self efficacy of the person reading it. For example, in EMS textbooks, there is an increased diversity shown, but only of those who are patients, and not caregivers (Hunter, 2005). In order for textbooks to have a more powerful effect it is important they don't limit who is shown as being diverse in them.

LEADERSHIP PROGRAMME TRAINING

Leadership programme training entails guiding students through volunteer services and moral education initiatives, incorporating service learning to contextualize learning and build tangible skills (Wong et al, 2012). By engaging in meaningful activities that benefit the community, students experience increased motivation and critical reflection on their own life experiences. Through reflection, students enhance performance mastery, reduce anxiety and stress, and receive constructive feedback, thereby improving their learning capabilities, creativity, emotional intelligence, social communication skills, and critical thinking. Importantly, these programs also facilitate resilience in the face of failure and rebuild self-confidence and trust among peers, parents, and teachers. Overall, these initiatives demonstrate significant potential for enhancing self-efficacy, particularly among female students, addressing a demographic identified as needing such support.

Additional Support + Resources

INVITATIONAL THEORY

Invitational theory presents a valuable approach for teachers to cultivate students' perceptions of their capabilities, particularly relevant in domains like girls' participation in STEM. By fostering positive self-messages informed by verbal persuasions from teachers, peers, and parents, students develop stronger self-efficacy beliefs. Notably, girls tend to send more messages than boys, yet still exhibit lower self-efficacy statistically, suggesting the differential impact of verbal persuasion on gender. Invitational theory offers promising avenues for educators to enhance students' self-efficacy beliefs, crucial for academic performance, motivation, and achievement, aligning with principles of social cognitive theory. As highlighted by Kiran and Sungur, nurturing self-efficacy through invitations is integral for optimizing student learning outcomes and refining principles of social cognitive theory (2012).

SAME RACE MENTORS

Race is also a very important influencing factor for a student's self efficacy beliefs. When looking at same-race mentors, specifically in an educational environment, having access to this can foster diversity and create an increased sensitivity to the cultural needs of students, leading to more effective education. Further, racialized groups are also shown to have a higher degree of self efficacy for occupations dominated by their own racial/ethnic group. When it comes to science and technology, racial/ethnic groups are underrepresented in these fields and thus have a lower self efficacy regarding these areas. It is clear here that the race/ethnicity and gender disparity in certain workforces directly influence self efficacy, which has an increased predictive effect on career choice.

Additional Support + Resources

SOCIAL CLASS

When looking at social class, we can also see the effects it can have on self efficacy. Social class, as defined by Anyon, is a series of relationships to several aspects of the process in society by which goods, services, and culture are produced. In fact, students from higher social classes are more likely to be exposed to legal, medical, or managerial knowledge whereas students from lower social classes are more likely to be exposed to “practical” clerical, vocational, training knowledge (Anyon, 1981, p. 3).

Social class alone can determine your access to vicarious experiences, and access to forming positive self efficacy beliefs. This is furthered when looking at students in the working class having lower self efficacy beliefs, and less belief that they could go to post secondary school because “they knew what it takes to be smart”, and they did not believe that they had this, or the money for it. Even their textbooks were shown to have less information, as they were referred to as “low ability students”, where teachers were encouraged to “just do your best, if you teach them something that's a bonus” (Anyon, 1981, p. 8).

Middle class students are shown to be encouraged that they could be anything when they grow up, with the themes of possibility, and “work hard and you will go far” (meritocracy).

It is clear here that students in the middle and upper class schools are being given positive messages from their teachers, whereas students in the lower class are already being put at a distinct disadvantage of forming self efficacy simply because of their social class.

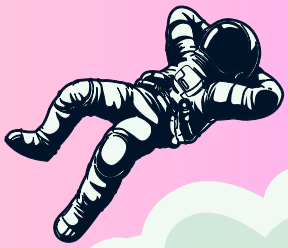
Additional Support + Resources

UNEQUAL SELECTION/SELECTEDNESS

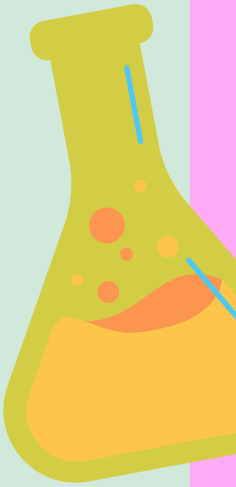
It is important to note here the notion of unequal selection, as well as unequal selectedness, as these can also play a role in a students' access to forming positive self efficacy beliefs. Unequal selection as noted by Bourdieu and Passeron, is the unequal access to educational opportunities because of social origin or socioeconomic status (1977). That is, disadvantaged backgrounds face barriers because of their race, gender, or socioeconomic status. This is especially important in correlation to unequal selectedness. Unequal selectedness is the differential outcomes/achievements of individuals who have been selected/chosen for educational opportunities (Bourdieu and Passeron, 1977). Even when individuals from a disadvantaged background access education, they may still face challenges resulting in unequal opportunities. These challenges are important to note, as are many of them as factors that were discussed previously.

IMPLICATIONS

It is also important to note here the implications that outside factors can have on the formation of these positive self efficacy beliefs. For example, no matter how much self efficacy a woman has for a corporate president role, the culture of that organization must also support and align with these values in order for these opportunities to happen. Corporations and workplaces must also support these cultures as well (Hunter, 2005).



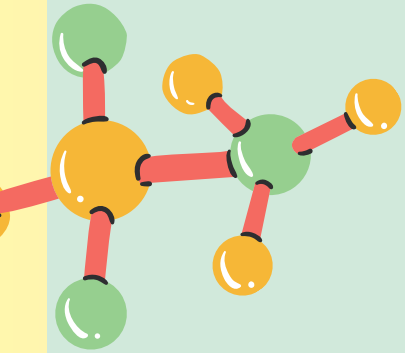
STEM Supergirl!



Presented to

Student's Name

FOR YOUR OUTSTANDING
PERFORMANCE THROUGHOUT THE
STEM WORKSHOP

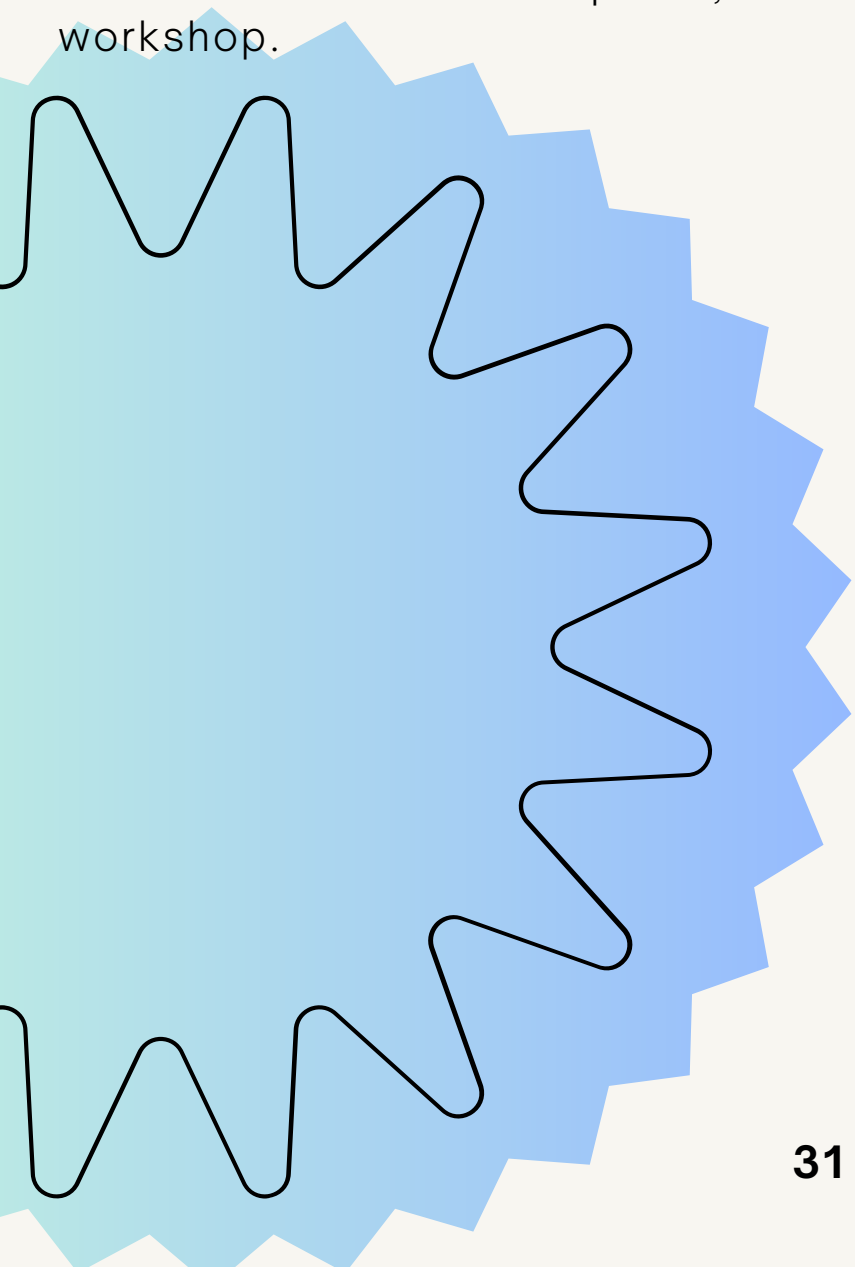


Date

Signature

FINAL THOUGHTS

It is clear that self efficacy plays a role in students academic performance, and their career path, specifically with girls. Gender seemed to be the most influential factor on the development of one's self efficacy, specifically in girls, as well as their teachers, peers, and parents. Race and socioeconomic status also intersect to have an impact as well. Overall, different factors do play a role in the development of one's self efficacy, which can be translated to academic and career paths, and can be strengthened by this workshop.



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