Diversity in Classroom Literature & Leadership

Book: "The Girl with A Mind For Math" by Julia F Mosca	**Lesson Slides:** MindForMath_Public
Themes: Advocacy & Persistence	**Grade:** 2-6
Essential Question: How does persistence help us achieve our goals?	

Content Objectives: Students will explore the concepts of advocacy and persistence by examining the life and work of Raye Montague, a black female engineer who was not allowed to study engineering because of her gender and skin color. But that didn't stop Raye, she taught herself and eventually became the first person to design a military ship with a computer program – a program she designed after the other engineers declared it was impossible. Students will learn that with hard work, persistence and a little humor they can also overcome obstacles and achieve their dreams.

Literacy/Language/Science/Art Objectives: Students will work in groups to make soap powered boats and practice making scientific observations about their boat's design and movement. There are also additional opportunities to add in math and engineering objectives such as measuring and analyzing information if one chooses.

Diversity, Civics and Advocacy Guiding Principles: Guiding Principles 1, 2, 3, 4, 5, 7

State Standards: 2.RL1-3;SL1-3, L5;STE PS1-2, PS31, ETS1-3;W10 3.RL1,3;SL1-3, L5; PS1-2-1, ETS1-2;; W10 4.SL1-3; ETS1-3; W10 5.RL1, SL1-3;HHS T5.7;ETS3-2;W10 6.RL1, SL1;ETS2-2;W10

SEL Standards: Self Awareness SEL1, 3 ;Self-Management SEL4; Social Awareness SEL 5-6;; Relationship Skills SEL 7-10; Responsible Decision Making SEL 11-12; APL 1-8

Student "I can" Goals:

Define Self-Advocacy & Persistence	Understand the importance of self-advocacy and persistence	Practice persistence and problem solving

Materials Needed: Worksheets

Instructions/ Lesson Sequence:

NOTE: This lesson was designed to allow you to break it in half (at the after book discussion or after teacher does their boat) if it's better for your schedule. It also allows for extension activities if you want to do these activities over different days. Make a copy of the lesson and adjust it to meet the needs of your class and grade standards, even if you do a different brain break. You can also shorten it by removing some of the questions that you feel aren't as aligned to your grade standards.

Before Reading:

- Read "I Can Statements" and "Lesson Objectives"

- **Slide 6**: Review vocabulary- **Segregation: Laws and policies that keep people separated based on a characteristic or difference.** Today we are talking about segregation based on skin color, but people have also been segregated based on their gender, religion or if they've had a disability and more. It's a way to keep people separate. Once separated the groups are treated differently, with one group having more freedom than another. **Self-Advocacy: Speaking up for yourself so you can get your needs met.** (*give an example here or if your class has already read Lailah's Lunchbox, you can remind them of the example DL's used - say it's difficult for you to see what your teacher is doing when you sit in the back of the room. Self-advocacy would be telling your teacher that you need to sit closer for you to do your best learning*). **Engineer: A person who uses science and technology to design and build things.** You can explain there are many different types, but today's book will focus on ship building. **Headstrong: Very determined to do what you want without listening to others. Persistent**: Determined to achieve goals even if it's not easy. You don't give up. These two mean similar things, except when people use the word headstrong, they often mean it in a negative way. Although many people view it as a good thing because sometimes people aren't worth listening to, especially the people who tell you you're not good enough. **Persistent** is a more neutral word, it's not seen as good or bad. You are just **someone who doesn't give up.** If something doesn't work, you try a different way. You problem solve and try again.
- **Slide 7**, Review map: Show where we are relative to Arkansa and DC.
- **Slide 8**, Remind students of where segregation was required by law. Segregation happened in every state, but these states required it or you could get in trouble with the law. Again, show where Arkansa and DC are located.
- **Slide 9**, Share book title. Start reading or Ask, what do you see on the front cover? What do you think the book will be about?

<u>During Reading:</u>

- **Slide 11,** Do you think the word Headstrong here means something positive or negative?
- **Slide 12**, Why do you think he told her she doesn't have to worry about knowing how to make a ship? (*he didn't think she could ever be an engineer-don't have to get into why here*).
- **Slide 15**: What do you think about the school not letting her study? (*see what they say*) Do you think that will stop her? (*Remember she's headstrong*!)
- **Slide 16,** What's the capital city of the United States? (*Washington D.C.*)
- **Slide 18**, Can you imagine, never being trained as an engineer and doing an entire team's work? It's so impressive!
- **Slide 19,** What do you think sublime means? (*excellence that inspires you, something so awesome and amazing, it fills you with wonder and joy*)
- **Slide 22,** What do you think abhorrible and deplorable mean? (*disgusting/beyond horrible and shockingly bad/unacceptable*)

<u>After Reading: (Slide 29)</u>

- **Slide 29,** <u>Why do you think this book was written in the form of a poem?</u> (*see what they say, but remind them poems have patterns like math and she has a mind for math*)
- **Slide 29,** <u>Why do you think everyone laughs when she tells them she wants to be an engineer?</u> (*see what they say*. Answer: *2 reasons- at that time girls were expected to get married and have children and usually didn't have jobs, especially jobs that required a college degree, like being a scientist. Some people didn't think women were smart enough, although there were many successful female scientists throughout history. We don't often hear of them, but they are there and now there are more books and resources out there for us to learn about them. The other reason people didn't think she could do it was because of her skin color. Schools were segregated back then and many colleges didn't allow black people to attend and you had to go to college to get a degree in Engineering. Luckily, Raye was so smart, she taught herself. All this was happening during the civil rights movement, which means a lot of people were speaking out against treating people this way. The more people speak out against unfair treatment, the more things begin to change*).
- **Slide 29,** <u>How do you think Raye felt when she wasn't invited to the unveiling of the ship?</u> (*see what they say*) <u>How would you have felt?</u> (*see what they say*)

- **Slide 29,** Engineers are problem solvers, they see a problem and design something to fix it. It's what they love! As an expert problem-solver, Raye probably wished she could fix the way she was being treated. But the problem wasn't Raye, it was the way other people thought about skin color and gender. We can advocate and educate, but at the end of the day only they have the power to change their own minds. That's hard and Ray had to find ways to deal with it. Does anyone remember what kind of things she did to help her deal with being treated unfairly? What was her solution? (*headstrong, humor and hardwork, she stuck with her dream even when others told her she couldn't, she was quick with a joke and outworked everyone*)
- **Slide 30, Pair Share:** What kinds of things have you done or would you do if someone was treating you unfairly? *(help them focus on what they'd do rather than what they would feel like they did above. See what they say and guide them on good things to do)*. NOTE: They can talk about anything, but you might want to give them an example of a time you had to advocate for yourself to model what kind of answer you're looking for. My personal example to model for you - I often have people use the term "real parent" when asking me about my children's biological family. I don't take offense to it, but many adoptive parents do and I know it can be really hard on a parent who is infertile so I like to educate people.. I found correcting people makes them feel bad and I don't want them to feel bad, so I'll often either summarize what they are saying using the correct term "biological or birth parent" or make a joke where I look at myself and say "Real? Are you telling me I'm a simulation! That would explain a lot." and then repeat what they had said using the term biological or birth parent.

BRAIN BREAK (Slide 31) (3 mins): Friction & Focus: Have students rub their hands together quickly for 15 seconds and then place their palms over their eyes and do 3 deep breaths to clear their minds. Their hands will heat up due to friction and the warmth on their eyes can be soothing. Repeat.

Why did your hands heat up? (*see what they say*). They heated up because of friction. Whenever 2 objects rub up against each other, it causes friction. You have to really put effort into making your hand rub against the other hand, because the two surfaces don't want to move over each other unless you work at it. This resistance is friction. Car wheels get resistance from the road. If you don't push on the gas the car will eventually stop because of the resistance, which we call friction. If friction didn't exist, cars would be able to drive forever without a need to keep pushing on the gas! Boats, like the one Raye design, also experience friction from water. Water molecules/particles "stick" to the boat's surface and are dragged along with the boat as it moves and work against the boat's movement. When engineers design boats they have to think about how they want to shape their boat to reduce the amount of friction it will experience. The more the boat surface touches the water, the more friction there will be and the harder the boat will have to work to keep moving. That's just one of the many problems Raye had to think about in designing her boats.

Discussion: **Slide 32,** In science and life we encounter many problems. Sometimes we can easily figure out how to solve the problem we are working on, and sometimes we have no idea where to even begin. The cool thing about scientists is that they use a method to try and solve problems, it's called The Scientific Method. (feel free to add in a slide on the scientific method if you want to speak about it more because this is a very basic overview to emphasize it involves failing a lot), It's a pretty great way to solve problems. Scientists ask questions, think about what the answer might be and then test their ideas with experiments. While doing an experiment they make observations, record their notes and then think of even more questions to ask! That last part is important. Scientists are always asking questions! Overtime and after testing lots of different ideas, they begin to understand how something works. Let's take a look at how this works. Scientists ask a question about how something works, they think of a potential answer called a hypothesis and then they test their idea with an experiment. Want to know a science secret? Many times the experiments FAIL! (Click through the slide to bring up more content) But that's okay, because failure teaches you things too. It teaches you what doesn't work and sometimes you have to figure out all the ways things don't work before you can understand how they do work. Because scientists fail A LOT, they have to be persistent and headstrong like Raye. Failure cannot stop you from moving forward. You have to problem solve and keep trying in new and different ways to achieve your goals. Eventually you will find a way. This applies to life as well. Ray couldn't go to college and study engineering like she wanted, so she had to try another way to achieve her dream. It wasn't the path she had thought she was going to take, but she still ended up where she wanted to

be. After learning about her story, would you say it was a good or bad thing that Raye was headstrong? (*see what they say*) Yes, in the end, her persistence, self-advocacy and hard work paid off. We all have the ability to be like Raye and today's activity is going to help us learn to be persistent like Raye! Who wants to be an Engineer for the day and make our own "soap-powered" boats?!

ACTIVITY (20-25 MINS) Slides 31-35: *"Soap Powered" Boats*

First put students in groups of 2 and pass out Observation worksheet

The first boat is for you to do as a whole class so the students understand what is being asked of them. They can draw the boat on their worksheet before you demonstrate. They can come up as a class to observe and then record observations on their worksheet when they get back to their seat. Do the observations as a whole class so you can walk them through what kinds of things to record.

- *Scaffold: There is a version of the Observation worksheet that provides guidance on what to record. There are a few copies in your bag. Make as many copies as you want for your class.*

1.Teacher Boat: Your boat is made from waterproof paper (10 mil Splashproof)**.** Cut it out ahead of time or do it during the lesson so you can talk about the shape. We've included a few extra boats for you. Make sure to have your soap (put a little in the cup we provided), cue tip and tray ½ way full of water. We provided some art trays at each school for teachers to share in case you don't have your own. Please make sure to put them back when you are done.

Gently put the boat in the water towards the bottom of your tray. If you're not gentle and slam it down, it will take on water and sink. Use the cue tip to pick up some soap and place it in the notch cut out of the back of the boat. The boat will propel forward. You can only do this once (maybe twice if you didn't use a lot of soap). You must replace the water if you want to do it again.

Why does it work? The boat is not really powered by the soap. The movement is actually a result of the boat being pulled forward by water molecules due to the difference in surface tension at the front of the boat versus the back. Molecules of a liquid attract each other and at the surface this attraction (cohesion) creates surface tension, or a thicker layer of molecules at the top/surface. Basically, water molecules rather stick with each other than the air. They form stronger bonds up at the top because they only have the water below them to stick to. This strong layer acts like film/barrier and is what allows bugs to walk on water! The soap breaks up the water molecules and reduces the surface tension in the back of the boat, as a result the boat moves forward toward the area of higher surface tension – basically there is a greater force pulling on it in the front versus the back. Once the soap has spread across the surface of the water, the boat stops moving forward. If you are in a grade that teaches about surface tension or force, please use the slides after the ticket to go to aid your discussion.

2.Student Boats: Students will have the option to test different materials and alter the shapes of their boat design. Each student will pick a material: Aluminum Foil, Foil paper, or regular paper. Partners MUST pick different materials from each other. Students will then design the shape of the boat they want to try, they just need to make sure there is a notch in the back for them to put the cue tip with soap. They can make a boat shape like yours, a triangle, rectangle, circle, etc. After they design their boat, they need to draw and describe it on their observation sheet. They also need to do that for their partner's boat.

After students make their boats, have them clean up their workspace. Scientists must keep their spaces clean or it can ruin an experiment! Once the room is clean, pass out the art trays and cue tips to each student. Partners can share a soap cup. Students can fill their tray with water (using a jug and refilling it at the sink may work best). Once they have all the materials the partners will take turns testing their boat and recording their observations. Each student is filling out their own

worksheet. Have them clean up before you start your wrap up discussion.

NOTE: foil paper doesn't not work well and we added it on purpose for students to experience failure. Make sure to praise their failure. They did the experiment right and got the correct results! It's never as much fun to not have it work like we want, but those experiences teach us the most.

Wrap up discussion: Ask the class the following questions: What materials worked well? Which ones didn't work well? Did their boat go far? Did it go in a straight line? Which shapes worked best? What did they learn? (they can record it on their sheet if you want) Does this make them curious about how other things work? What kinds of things are they curious about? (they can record it on their sheet if you want)

Extension ideas: If you wanted to add math to this lesson you could ask them to measure the dimensions of the boats they make and/or how far the boat moves in the water to compare to their partner. If you want to add more elements of engineering for older students, you can give them parameters for the design and dimensions of a boat that they then have to make. You can also do a KWL before the teacher experiment–what do you know about boats, have you ever been on one, what are you hoping to learn, etc.

*Close Lesson: 15-20 sec summary . Ticket to go will just be done as a whole class discussion now (**Slide 35**): Read questions on powerpoint to them, thank kids & teacher, say when you're back.*

Assessment: Wrap up questions to class: Ticket to Go

Homework:	**Additional Resources:**

Diversity Leader Reflection Notes:

Class 1:

Class 2: