

VAI EDUCATION SPOTLIGHT

5 Ways to Use Science to Teach Social Emotional Learning

Why it Matters

Over the past two years schools have seen a dramatic increase in the need for social emotional learning. As educators, we understand the importance of teaching the whole child. The ability to develop and maintain positive relationships and manage thoughts, emotions and behaviors is just as crucial as academic success. Studies have shown that students exposed to SEL have improved academic performance, skills, social behaviors, and attitudes. ([The Practical Benefits of an SEL Program 2019](#)) However, the real reason why SEL matters can be summed up in a popular social media quote, “If a child can do advanced math, speak 3 languages, or receive top grades, but can’t manage their emotions, practice conflict resolution, or handle stress, none of that other stuff is really going to matter.” ([Twitter: @MiaMagdalena](#)). So, SEL is important, but how do we do it?

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— [Twitter: @MiaMagdalena](#)

The Big 5

The Collaborative for Academic, Social, and Emotional Learning (CASEL) developed a framework for SEL implementation highlighting five core competencies:

- **Self Awareness:** When students are self-aware, they can recognize their own strengths and weaknesses. They are able to acknowledge and understand their thoughts, feelings, and actions.
- **Self Management:** Impulse control, stress management, and effective organizational practices are a few of the characteristics of students who can successfully manage their thoughts, feelings and emotions.
- **Social Awareness:** Students who are socially aware are empathetic and able to think beyond themselves and their current situation. They appreciate diversity and work to understand the perspectives of others, including those from different backgrounds, cultures, and beliefs.
- **Relationship Skills:** Students who communicate effectively, collaborate productively, and respond appropriately in social situations have mastered the art of relationship-building. They develop and maintain positive connections with diverse individuals and groups.



- **Responsible Decision-Making:** Identifying and solving problems, appropriately analyzing situations, and reflecting on choices are a few of the skills exhibited by students who excel at decision-making. These students make careful and calculated decisions regarding their actions in different social situations.

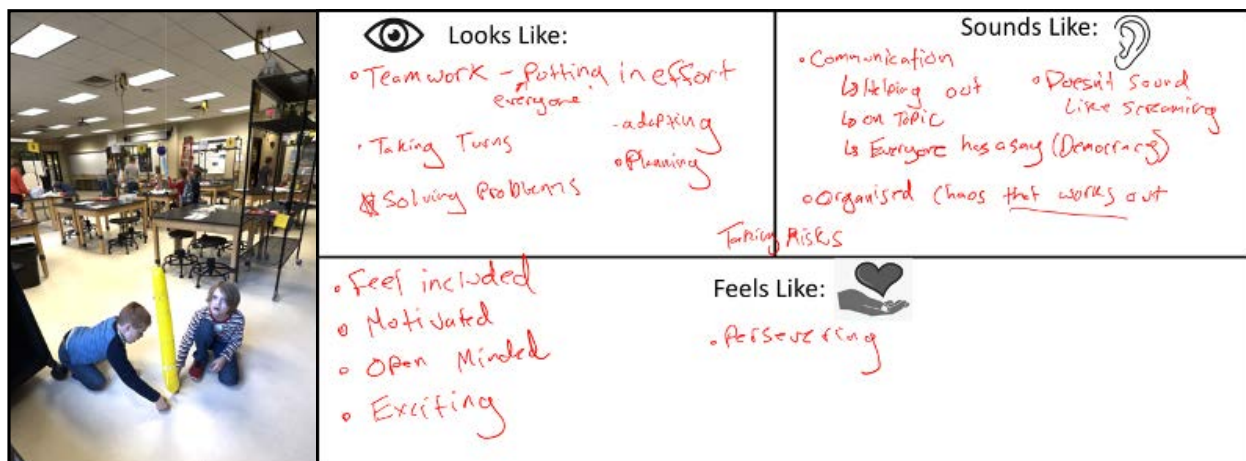
These five core competencies are a great place to start when connecting your content to non-cognitive skills. Here are five science investigations where we intentionally integrated the CASEL core competencies:

Science Lessons Using the Big 5

1) Balloon Rockets → Relationship Skills

In [Balloon Rockets](#), students design, build, and test a lightweight rocket that is able to carry the greatest payload possible. Although this is a very engaging engineering challenge, we found that this was difficult for students as it requires careful planning and productive collaboration to accomplish. This was a great opportunity to connect this lesson to improving relationship skills while focusing on collaboration and teamwork.

After completing the balloon rocket challenge, students reflected on their experience using a [Collaboration Y Chart](#). We placed “collaboration” at the center of a paper that was divided into 3 sections: What does it look like? What does it sound like? What does it feel like? Students spent time thinking independently and jotting down their ideas. We then created a large class list that will serve as an anchor chart that we can refer to during future collaborative opportunities. Anchor Y charts are a powerful way to intentionally teach those incredibly important non-cognitive skills and can be used at any grade level and within any content area.



Students testing their balloon rockets.

Collaboration Y Chart Example

2) Lights Outs → Self-Management

Providing students with sustained, authentic learning experiences is at the heart of our mission to build the next generation of problem solvers. We want students to take ownership of their learning and have choice in the investigation process. In one particular lesson sequence, we discovered that students were struggling a bit with self-management. First, students are challenged to discover how they can **Light the Bulb** using a battery and wires. They make observations on what works and what doesn't, and construct explanations based on their results. Then, they apply their new knowledge of circuitry in an engineering design challenge, **Lights Out**. Here they are tasked with building a flashlight under predetermined criteria and constraints. They design, build, and test their device to determine if they need to refine or scrap their design.

Because this is a sequence of investigations that could be run a few days in the class, students are often at different spots throughout the series and self-management becomes crucial to their success. To encourage self-management in sustained inquiry situations, we have students use [Work Logs](#) to keep track of what steps need to be completed as well as how they will show when each task is done. This is a great tool to scaffold this very important skill to help your students become more self-directed and productive.



Students discovering how to light the bulb.

3) Mystery Powders → Responsible Decision Making

A scientific investigation requires a fair test in order to be confident in the results. When engaging in an investigation, students must make responsible decisions to ensure they generate quality data and minimize experimental error. In the **Mystery Powders** investigation students investigate chemical and physical properties of matter. They run chemical tests on multiple powders to identify their characteristics and use their observations to identify the mystery powder and catch a criminal.

Throughout this investigation students have decisions to make: *Do I carefully follow procedures? Or cut corners?* These decisions can impact the outcome and quality of the data they collect as well as credibility of their explanation. In order to help students reflect on their decision-making skills and how their decisions impact their investigation outcomes, we have them complete the [Cause and Effect Evaluation Rubric](#). This is a great tool for students to evaluate their investigation process and use their reflection in the reasoning portion of their [explanation](#).

Cause and Effect: Decision Making	
Carefully following procedures you, or other scientists, have created can impact the outcome of your investigation. Use the following rubric to evaluate how your decisions affected the results of your investigation.	
Choice:	Evaluation:
I recorded detailed observations as I saw them.	(Never) 1 2 3 4 5 (Always)
I carefully labeled containers and powders throughout the investigation.	(Never) 1 2 3 4 5 (Always)
I measured and used the same spoon with each powder.	(Never) 1 2 3 4 5 (Always)
I used a clean container and stir stick for each test (water-vinegar-sodium test).	(Never) 1 2 3 4 5 (Always)
I used consistent sample sizes of each powder (1 scoop).	(Never) 1 2 3 4 5 (Always)
I carefully measured and used a consistent amount of water/vinegar, and iodine for each test.	(Never) 1 2 3 4 5 (Always)
Average Score: _____	
How do you feel the decisions you made throughout the investigation impacted the results of your data?	
What would you do differently next time?	

Cause and Effect Decision Making Rubric for Mystery Powers

4) What's in Your Water? → Social Awareness

We want our students to engage in work that matters. Work that has a purpose. Project-based learning does just that. In the [What's In Your Water](#) project-based learning unit, our students learn all about water. They build watershed models and collect local water samples to run tests to determine water quality. We challenge them to engineer solutions to prevent water pollution. They even hear from experts in the water industry. But the learning does not stop there!

Students also explore water issues that exist in the world and share with an authentic audience by hosting a share fair or designing a fundraiser to raise money for a water charity of their choice. Social awareness is truly at the heart of project-based learning. Students learn the content they need to learn in the context of a meaningful and sustained project and are empowered to make a difference. [Check out this project in action!](#)








Students collecting water samples in the What's in Your Water? project

5) A-MAZE-zing Spheros → Self-Awareness

When students are exposed to coding and robotics for the first time, they must exercise tremendous perseverance and fortitude. The [Sphero Maze challenge](#) is a great introduction to programming and robotics. Students are introduced to computational thinking and block coding as they navigate their Sphero through a maze and attempt to decrease the amount of time it takes the Sphero to get through the maze. This challenge is incredibly engaging, but it can also be incredibly frustrating. We found that this was a great opportunity to help our students sharpen their self-awareness skills.

Students that are self-aware are not only able to recognize their strengths and weaknesses but can also see their potential. Programming requires a great deal of trial and error and perseverance. Using [The Power of Yet](#) self-assessment, students can shift their fixed mindset to a more growth mindset. This assessment serves as a reminder for students that they are capable of completing each challenge, they just might not be able to YET.

THE POWER OF YET			
Goal	Yes	Almost	Not Yet
I can create a square with my sphero 			
I can create a triangle with my sphero 			
I can create a circle with my sphero 			
I can program my sphero to make noise 			
I can program my sphero to light up 			

K-2 Sphero example of The Power of Yet self-assessment.



Students coding their Spheros to complete the maze.

Our Favorite Anytime SEL Strategies

Social emotional learning strategies and resources don't have to be used in just one content area, but can be integrated into the conversations and discussions you have with your students every day. Here are a few of our favorite SEL strategies that can be used anytime, and in any content, and grade level:

- **Apology, Appreciation, Awareness (Self-Awareness):** This strategy gives students a frame for discussion and develops ownership when negative behavior occurs.
 - **Example:** "I apologize for interrupting our math group discussion, I appreciate how my group didn't yell at me for doing so, and I recognize that I need to work on not blurting out my ideas and opinions when someone else is talking."
- **SMART Goals (Self-Management):** Help students take ownership of their learning by helping them craft [SMART goals](#). For a particular objective, support students in setting goals that are Specific, Measurable, Achievable, Relevant, and Timely.

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- **Discussion Mapping (*Social Awareness*):** Discussion mapping gives students a visual for the discussion that took place. It also allows students to think deeply and take in different perspectives. Here is how to do it:
 - Introduce the topic.
 - Allow students to run the discussion on their own.
 - Observe and map the discussion on paper by writing students' names on a sheet of paper and drawing arrows from speaker to speaker as the discussion occurred.
 - Share the map and debrief.

Check out this strategy in action [here](#).

- **Positive Classroom Rituals (*Relationship Skills*):** Start building your classroom community by making connection rituals a norm. Try the [shout-out](#), or [appreciation](#), [apology](#), [aha strategy](#) to encourage positive relationships.
- **Reflect on Decisions (*Responsible Decision-Making*):** With this strategy students have opportunities to develop and continue to demonstrate thoughtful decision-making through reflection. [Use this resource](#) to help guide your students in this process.

Looking for more ideas? Check out the [Strategy Explorations: Social Emotional Learning](#) for additional ways to bring more SEL into your classroom!

Making PBL a Reality

What's in Your Water?



If you'd like to try project-based learning to connect to your female future scientists, check out the Blue Apple Project, [What in Your Water?](#), where students learn about all things water; from watersheds to water pollution. They will investigate water samples to determine what's in their water, develop ways to improve water quality, and share what they've learned by creating a fundraiser to raise money for a water-specific charity.

- This [Project Overview](#) provides a lesson-by-lesson summary of this project.
- Here is a [Recommended Book List](#) of rich, diverse literature on the topic of water and watersheds.
- Check out [K-8 Content Standard Connections](#) for this project.
- To see this project in action, check out the [project video](#).

Conclusion

Providing students with opportunities to grow not only academically, but socially and emotionally matters. Think about the lessons you teach. How can you infuse a few strategies that support the development of these skills? Can they become more empathetic? Can they adeptly acknowledge and manage their emotions? Just because these skills are not considered testable by state standards, they are pivotal to the success of our students by life standards

[Click here if you would like to see a 30-minute webinar presentation of this content: 5 Ways to Use Science to Teach Social Emotional Learning](#)

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