SPONSORED BY CAROLINA® | Building Blocks OF SCIENCE® 3D

AUTUMN 2019

Social and Emotional Learning in the 3-D Science Classroom

Social and emotional learning (SEL), those soft skills that have traditionally been key for young learners, are increasingly becoming integral components of the school day for all grades—from preschool through high school.

Research supports that these skills create a foundation for better emotional adjustment and academic performance, leading 11 US states to extend SEL competencies and standards to early elementary classrooms and 18 states to institute them for grades K–12.[1] (All US states have SEL competencies/standards for preschools.[2]) As a result, teachers in elementary, middle, and high schools are being required to incorporate SEL into schedules that are already jampacked as they strive to meet academic standards and achievement goals.

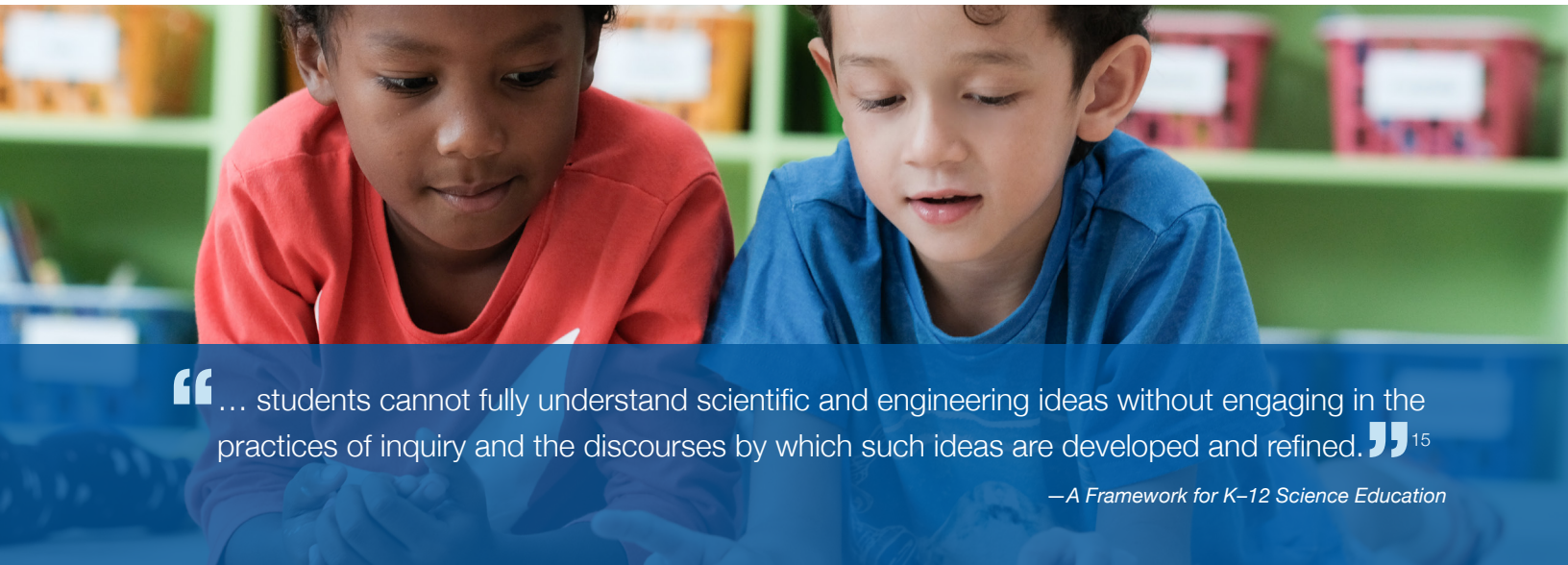
For some areas of learning, blending social and emotional understanding into coursework may be seamless, such as introducing literature that supports SEL as well as literacy goals. But what may be unanticipated is that SEL is an integral component of science standards that are based on the National Research Council's *A Framework for K–12 Science Education*.

"There is an inherent, built-in presence [of social and emotional learning] in hands-on science where a teacher has established a community in the classroom," Mary Rosa, a curriculum product developer for Carolina Biological Supply Company, says. "In a hands-on science classroom, it's not the teacher talking *at* the students but instead the students *working together* to answer a question, to solve a problem."

The SEL Movement

For more than two decades, the Collaborative for Academic, Social, and Emotional Learning (CASEL) has actively supported districts, schools, and states in SEL initiatives by working with leading experts to drive research, guide practice, and inform policy.

According to CASEL, SEL is "the process through which children and adults understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions."[3]



"… students cannot fully understand scientific and engineering ideas without engaging in the practices of inquiry and the discourses by which such ideas are developed and refined."[15]

—A Framework for K–12 Science Education

CASEL lists the core competencies of social and emotional learning as:

- Self-awareness
- Self-management
- Social awareness
- Relationship skills
- Responsible decision-making

CASEL maintains that SEL programming benefits children of all grade levels, of all races, of all socioeconomic backgrounds, and in all locations. Its findings have been compiled from hundreds of studies, grabbing the attention of policy makers, administrators, and classroom teachers alike. For example:

- A 2011 meta-analysis involving more than 270,000 kindergarten through high school students demonstrated that SEL participants had an 11-percentile point gain in academic achievement.[4]
- A 2017 meta-analysis of 82 research studies of more than 97,000 grades K–12 students worldwide supported that SEL programming can have positive impacts on academics, conduct problems, emotional distress, and drug use up to 18 years later.[5]
- A review of six SEL interventions showed that for every dollar invested, there was an economic return of $11.[6]
- Teachers who themselves have high levels of social and emotional competence are better able to protect themselves from burnout, leading to higher retention rates.[7]

Additionally, employers are seeking candidates who have strong soft skills as well as technical knowledge. In a 2015 *Wall Street Journal* survey of 900 executives, 92 percent responded that skills such as problem-solving and critical thinking are equally or more important than technical skills.[8] "Employers frequently list teamwork, collaboration, and oral and written communication skills as highly valuable yet hard-to-find qualities in potential new hires," David J. Deming, a Harvard professor and research fellow at the National Bureau of Economic Research, wrote in a 2017 NBER report. He notes that although workplace automation is increasing, "Social interaction is perhaps the most necessary workplace task for which there is currently no good machine substitute."[9]

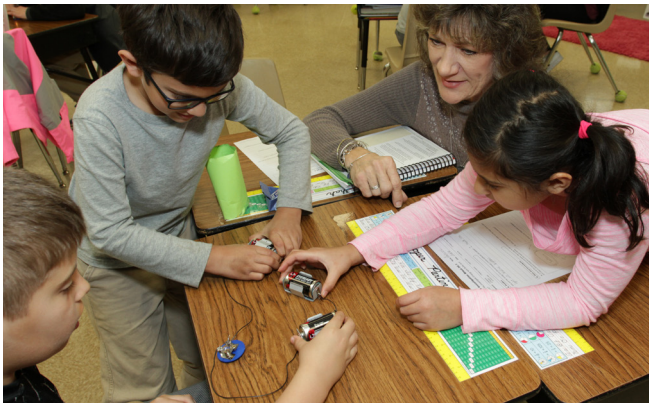
Despite widespread support for students acquiring soft skills, studies have found that SEL training for teachers is lacking in most schools, primarily due to time and funding constraints.[10] In a study commissioned by CASEL, the majority of teachers responding support SEL but only 55 percent reported receiving some form of SEL training.[11] In addition, a 2017 national scan of teacher preparation in SEL found that "an overwhelming majority" of teacher preparation programs in US colleges do not address any of the five core students' SEL competencies.[12] And referring to a busy, day-to-day classroom, over a third of respondents to a 2015 study said other demands take priority over SEL.[13]

Science Standards and SEL

As of the end the 2018–19 school year, science standards based on the *Framework*, such as the Next Generation Science Standards*, had been adopted in 42 states and the District of Columbia, representing nearly two-thirds of all US students.[14] The *Framework* presents three equally important dimensions: science and engineering practices, disciplinary core ideas, and crosscutting concepts. Science and engineering practices—those behaviors that scientists engage in as part of their daily work routines—require students to draw on and develop soft skills as they interact to investigate phenomena.

"It's important to understand the concept of phenomena to understand how it relates to social-emotional skills," Rosa says. A phenomenon is a naturally occurring, observable

event that can generate student interest and elicit questions. In a science investigation, it can be presented through pictures, video clips, lab demonstrations, or as an occurrence that students experience in the environment around them—and then reiterated through hands-on activities that strengthen students' understanding.



- Anchoring phenomena should serve as the main focus of an investigation. Introduced visually, such as through a video clip, it can spark students' interest, guiding them to make connections and develop relationship and social awareness skills as they communicate their thoughts, listen to their classmates' ideas, and strive to understand one another's perspectives.

- Investigative phenomena encourage students to develop a deeper understanding as they persevere in overcoming obstacles to develop explanations of the phenomena and then build models or design solutions to a problem. When presenting their designs or findings to classmates, students need to communicate clearly to present their reasoning using evidence-based claims while classmates are actively engaged through listening and notetaking.

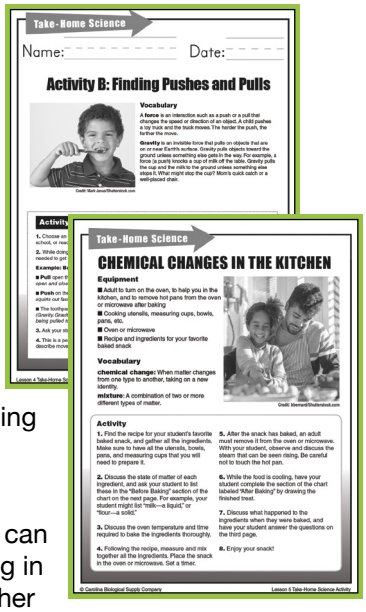
"Hands-on science hits all of the SEL pieces that a teacher can incorporate in the classroom," Rosa says. (See page 4.) She notes that curriculum developed to support three-dimensional learning, such as Building Blocks of Science™ 3D, leads students to work collectively—in pairs or small groups—to problem-solve, build models, and develop answers to driving questions as the teacher facilitates learning. While students work, even a simple thumbs-up or thumbs-down from a student can signal to the teacher how that student is handling the investigation on an emotional level and whether intervention is needed.

Facilitating Student Success

To develop vocabulary and effective communication skills, students should have opportunities to engage in familiar and relatable real-world phenomena to furnish a common contextual reference. A teacher's guide can provide guidance for this anchoring phenomena and lessons for the Activity Before Concept, Concept Before Vocabulary format.

As students consider the phenomena along with an investigation's driving question, they should have multiple opportunities to engage in **discourse** as they develop **claims** and support those claims with **evidence** and **reasoning**—and as they effectively **deal with conflict**, **control their impulses**, and **respectfully listen** to one another. Frustration points can be reduced by offering options in gathering information, such as literacy readers, printed investigation sheets, and digital simulations and whiteboard activities.

"There also are purposeful ways to keep kids accountable for actively listening to classmates," Rosa says. In Building Blocks of Science 3D, for example, grades 3–5 investigation sheets prompt students to write what they learn from other students in their groups, honing their relationship skills as well as their scientific understanding.



SEL can be extended beyond the science classroom through take-home components of an investigation, leading students to make ethical, constructive choices about social behavior. Rosa explains that when families are connected with the science activities, students are motivated to apply what they're learning to the well-being of the community.

As students complete their hands-on investigations, they can build self-awareness by writing in their science notebooks whether their solutions helped make sense of the phenomena and how they could improve their ideas, setting the stage for growth by acknowledging their strengths and limitations and building confidence to persevere in future investigations—both in and out of the classroom.

Science and Engineering Practice*	Social and Emotional Competency Examples
Asking questions and defining problems *Investigate sound waves: Can you see vibrations? How does the speed of vibrations affect sound? (grades K–2)*	* Relationship skills: communicate clearly, listen well, cooperate while engaging in discourse * Social awareness: understand perspectives of others, recognize strengths, adopt a growth mindset * Self-management: control impulses
Developing and using models *Student teams design, plan, and build an object to prevent the sun from warming sand. (grades K–2)*	* Relationship skills: negotiate conflict, cooperate * Responsible decision-making: make constructive choices about behavior * Self-management: persevere, set and achieve goals * Social awareness: understand perspectives of others
Analyzing and interpreting data *Students monitor Wisconsin Fast Plants® and butterfly larva, adding questions to class charts and referring to the charts throughout the unit. (grades 3–5)*	* Relationship skills: cooperate with others, seek and offer help when needed * Self-management: persevere to overcome obstacles * Self-awareness: recognize strengths, adopt a growth mindset, be optimistic
Using mathematics and computational thinking *Students collect volume data of water to model and graph the distribution of water on Earth. (grades 3–5)*	* Relationship skills: seek and offer help when needed * Self-awareness: recognize strengths, adopt a growth mindset, be optimistic * Self-management: persevere to overcome obstacles, manage stress, set and achieve goals
Constructing explanations and designing solutions *Students design an invention to show forces and interaction, allowing autonomy in devising a solution and the discovery that there can be more than one solution to a problem. (grades 3–5)*	* Relationship skills: cooperate with others, deal effectively with conflict * Self-management: persevere to overcome obstacles, set and achieve goals * Responsible decision-making: connect with the community to investigate solutions * Self-awareness: recognize strengths, adopt a growth mindset, be optimistic * Social awareness: recognize that there may be more than one solution
Engaging in argument from evidence *Each student in a group draws a part of the plant life cycle. Then the class considers the similarities and differences of each group's illustrations. (grades 3–5)*	* Relationship skills: communicate clearly, listen well, cooperate while engaging in discourse, deal effectively with conflict * Self-management: control impulses, manage stress * Social awareness: understand perspectives of others, empathize with others
Obtaining, evaluating, and communicating information *Engineer designs to show how glaciers, rivers, and Earth's natural processes change the land; present erosion models to classmates. (grades K–2)*	* Relationship skills: communicate clearly, listen well, cooperate while engaging in discourse, deal effectively with conflict * Self-awareness: express confidence, be optimistic * Self-management: manage stress, control impulses * Social awareness: understand perspectives of others, empathize with others

***Examples are from Building Blocks of Science 3D curriculum.**

REFERENCES

1. Collaborative for Academic, Social, and Emotional Learning. n.d. "Collaborating States Initiative." Accessed July 15, 2019. https://casel.org/about-us/our-mission-work/collaborating-states-initiative/.

2. Collaborative for Academic, Social, and Emotional Learning. n.d. "Collaborating States Initiative." Accessed July 15, 2019. https://casel.org/about-us/our-mission-work/collaborating-states-initiative/.

3. Collaborative for Academic, Social, and Emotional Learning. n.d. "What is SEL?" Accessed July 15, 2019. https://casel.org/what-is-sel/.

4. Durlak, J. A.; Weissberg, R. P.; Dymnicki, A. B.; Taylor, R. D.; and Schellinger, K. B. 2011. "The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions." *Child Development*, 82(1): pages 405–432.

5. Durlak, J. A.; Weissberg, R. P.; Taylor, R. D.; and Oberle, E. 2017. "Promoting Positive Youth Development Through School-Based Social and Emotional Learning Interventions: A Meta-Analysis of Follow-Up Effects." *Child Development*, 88(4): pages 1156–1171.

6. Belfield, C.; Bowden, B.; Klapp, A.; Levin, H.; Shand, R.; and Zander, S. 2015. "The Economic Value of Social and Emotional Learning." Center for Benefit-Cost Studies in Education, Teachers College, Columbia University. Accessed July 18, 2019. http://blogs.edweek.org/edweek/rulesforengagement/SEL-Revised.pdf.

7. Jennings, P. A., and Greenberg, M. T. 2009. "The Prosocial Classroom: Teacher Social and Emotional Competence in Relation to Student and Classroom Outcomes." American Educational Research Association.

8. Davidson, Kate. 2016. "Employer's Find 'Soft Skills' Like Critical Thinking in Short Supply." *The Wall Street Journal*, August 30, 2016. Accessed July 24, 2019. https://tgkvf.org/wsj-employers-find-soft-skills-like-critical-thinking-short-supply.

9. Deming, David J. 2017. "The Value of Soft Skills in the Labor Market." The National Bureau of Economic Research, NBER Reporter 2017 Number 4. Accessed July 30, 2019. https://www.nber.org/reporter/2017number4/deming.html. Pages 1, 3.

10. DePaoli, J. L.; Atwell, M. N.; and Bridgeland, J. Civic Enterprises with Hart Research Associates. A Report for CASEL. n.a. "Ready to Lead: A National Principal Survey on How Social and Emotional Learning Can Prepare Children and Transform Schools." Page 5.

11. Civic Enterprises with Peter D. Hart Research Associates. A Report for CASEL. n.a. "The Missing Piece: A National Teacher Survey on How Social and Emotional Learning Can Empower Children and Transform Schools." Page 8.

12. University of British Columbia. 2017. "To Reach the Students, Teach the Teachers: A National Scan of Teacher Preparation and Social & Emotional Learning." Page 9.

13. Editorial Projects in Education Inc. The Education Week Research Center. 2015. "Social and Emotional Perspectives from America's Schools." Page 22.

14. National Science Teaching Association. n.a. "About the Next Generation Science Standards." Accessed July 15, 2019. https://ngss.nsta.org/about.aspx.

15. National Research Council. 2011. *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Committee on a Conceptual Framework for New K–12 Science Education Standards. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press. Page 218.

ABOUT

CAROLINA

Carolina Biological Supply Company is a leading supplier of science teaching materials for preschool through college-level classrooms. Headquartered in Burlington, North Carolina, it serves customers worldwide, including teachers, professors, informal educators, and professionals in health- and science-related fields. Carolina is the exclusive developer, publisher, and distributor of the Building Blocks of Science™ 3D grades K–5 curriculum.

*Next Generation Science Standards® is a registered trademark of Achieve. Neither Achieve nor the lead states and partners that developed the Next Generation Science Standards were involved in the production of, and do not endorse, these products.

BUILDING BLOCKS OF SCIENCE™ 3D

Building Blocks of Science™ 3D is a hands-on, phenomena-based grades K–5 curriculum developed to establish a solid foundation in elementary science while addressing the NGSS. It provides all students with multiple opportunities to build social and emotional skills as they engage in three-dimensional learning anchored in phenomena.

LEARN MORE

www.carolina.com/bbs

curriculum@carolina.com

800.334.5551

Building Blocks OF SCIENCE® | 3D

CAROLINA®

CB884032202