

LEGO® Education Science Case Study

Strengthening K–8 Students' Understanding and Interest in Science

For many students, science class can be a window into the world, igniting their natural curiosity and wonder. Curiosity primes the brain to absorb and connect new information while simultaneously developing critical thinking and problem-solving skills.¹

However, as students enter grades 5–7,² many begin to feel “science isn’t for me.” Some students are no longer engaged, and science no longer ignites their curiosity. Other students are intimidated by the material, leading to lack of confidence in the subject.^{3, 4}

Teachers understand that the subject is challenging for many students. In a global survey on student engagement in schools, 77% of science teachers reported that students struggle because of intangible, complex concepts and curricula.⁵ As a result, teachers are eager for more time to explore impactful resources that examine real-world science phenomena and support every student’s success.⁶

At LEGO® Education, we believe that students learn best through joyful, hands-on learning based on research-backed learning science—by actively doing, exploring, and experimenting. This approach inspires deeper understanding and interest in science concepts and supports academic success.⁷



During the development of LEGO® Education Science, an inquiry-based, hands-on science program for grades K–8, learning sciences research informed the design and testing process. Throughout testing, LEGO Education researchers explored how joyful, inquiry-based experiences supported students’ understanding and interest in science, and the results were remarkable (full Case Study description on page 4).

Key Results: LEGO® Education Science Deepened Students' Understanding of Science Concepts and Interest in Science

- **Increased proficiency:** 100% of teachers reported that students were more likely to achieve lesson objectives in LEGO Education Science lessons than in regular science lessons.
- **Impactful lesson design:** More than 90% of teachers reported that the lesson objectives were well met, and lessons were effective in building understanding.
- **Heightened cognitive and affective engagement:** 80% of students reported staying focused during lessons, a key indicator of cognitive engagement. Additionally, 73% of students reported joy and excitement during the lessons, which are important measures of affective engagement.
- **Amplified interest in science:** 100% of teachers reported students showed interest in science after LEGO Education Science lessons.



Testing Our Approach: Hands-on Experiences as a Catalyst for Deeper Conceptual Understanding and Interest in Science

We believe hands-on, collaborative learning empowers students to make real-world connections so that learning sticks and interest ignites. By design, LEGO Education Science is a robust, interactive science program that instantly engages students in learning.

LEGO Education Science includes teaching resources for time-strapped teachers and administrators seeking flexible, hands-on tools. The curriculum offers student-led, inquiry-based science experiences delivered through hands-on lessons—developed using the following evidence-based frameworks and pedagogies— while aligning with local state standards as well as Next Generation Science Standards (NGSS):

Research-backed design principles of LEGO Education Science	Learning Through Play: The five characteristics of learning through play posit that the learning process should be joyful, meaningful, actively engaging, iterative, and socially interactive. ⁸	Constructivism and Constructionism: Knowledge is constructed through hands-on activities and meaningful creation of physical models with peer interaction and teacher guidance. ^{9,10}
	Guided inquiry with the 5Es Model: Scientific phenomena investigations follow the Engage, Explore, Explain, Elaborate, and Evaluate instructional model to build understanding gradually. ¹¹	Universal Design for Learning: Lessons are created to include multiple modes of representation, engagement, and expression that support accessibility and flexibility for all students. ¹²

While using the LEGO Education Science program, students collaborate as they explore diverse approaches to relatable and relevant science scenarios. The program integrates sense-making and joyful learning into over 120 standards-aligned lessons, supported by an online teacher portal with ready-to-use teaching resources and hands-on materials including LEGO® bricks and wireless hardware. Each lesson offers structured collaborative learning experiences in which students work in groups of four using colorful LEGO® minifigures that help students understand their assigned roles, offering an invitation to collaborate, communicate, and engage with their peers while investigating a science concept.

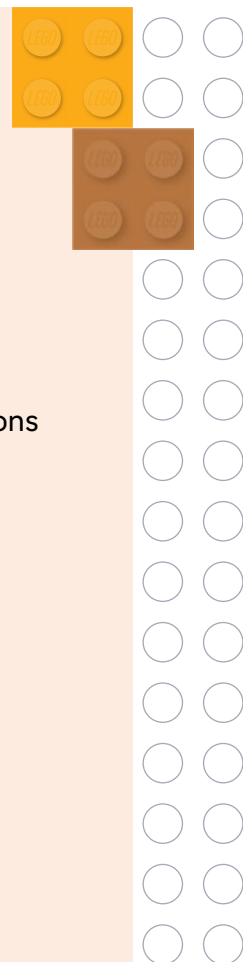
The Case Study

How can a science program elevate understanding of science concepts and interest in science? As this embedded case study unfolded, we paid close attention, examining LEGO Education Science implementation in diverse K–8 classrooms across the United States.¹³

As teachers implemented the five lessons in the study, researchers gathered quantitative and qualitative data on the impact of LEGO Education Science lessons on students' understanding of science concepts and their interest in the subject.

Case Study Snapshot

- **Timeframe:** Spring 2025 (2.5 months)
- **Districts:**
 - Compton Unified School District, CA
 - Irving Independent School District, TX
 - Northeastern School District, PA
- **School profiles:** Title 1 schools with large populations of multilingual learners, students receiving special education services,¹⁴ and those eligible for free or reduced-price lunch
- **Participants:**
 - 9 teachers with varied experience
 - » 5 generalists; 4 science specialists
 - » 3–31 years of science teaching experience
 - 201 students
 - » 64 in grades 1–2,
 - » 64 in grades 3–4, and
 - » 73 in grades 6–7
- **Data collection methods:**
 - After each lesson:
 - » Teacher post-lesson evaluations
 - » Student post-lesson surveys
 - At the end of the study:
 - » Teacher survey
 - » Teacher interviews
 - » Student focus group



Research Findings: Collaborative, Hands-on Experiences Nurtured Science Understanding and Interest

This case study illuminates what is possible when we reimagine science education: through collaborative, inquiry-based science experiences, students can develop a deep understanding of science concepts, critical thinking skills, and a lasting passion for scientific discovery.

This is especially true when instruction is delivered through joyful, hands-on experiences. As one student (Grade 6 student, TX) observed, “When you learn something and it’s fun, it sticks in your brain.”



Standards-aligned, Inquiry-based Curriculum Fostered Learning

The hands-on lessons of LEGO Education Science bridged abstract theory into physical models, making learning both accessible and memorable. As one student (Grade 6 student, PA), explained, “You could understand more. If they just showed a picture, you might not get it, but with LEGO [Education Science] you can see examples.” For instance, the model students build in the “Rapid Reaction” lesson simulates how our senses detect things and send messages to the brain to react or store as memories.

In surveys, teachers connected specific design features to their students’ learning progress. The guiding questions in the teacher facilitation notes and student-facing presentation prompted deeper thinking and peer discussion (rated useful in 96% of evaluations), while clear objectives helped students understand what they were working toward (93% rated as clear). The 5E lesson structure allowed students to construct understanding gradually rather than

receiving information passively (91% rated as effective). By the end of the study, 100% of teachers reported that students were more likely to achieve lesson objectives in LEGO Education Science lessons than in regular science instruction, suggesting these design elements work together to support learning.

In focus groups, students reported LEGO Education lessons as “fun” and “surprising”, or as one student (Grade 2 student, TX) explained,

“Normal class is boring, but LEGO® [Education] lessons are super fun, and you learn more stuff.”

Hands-on Learning Deepened Understanding of Science Concepts

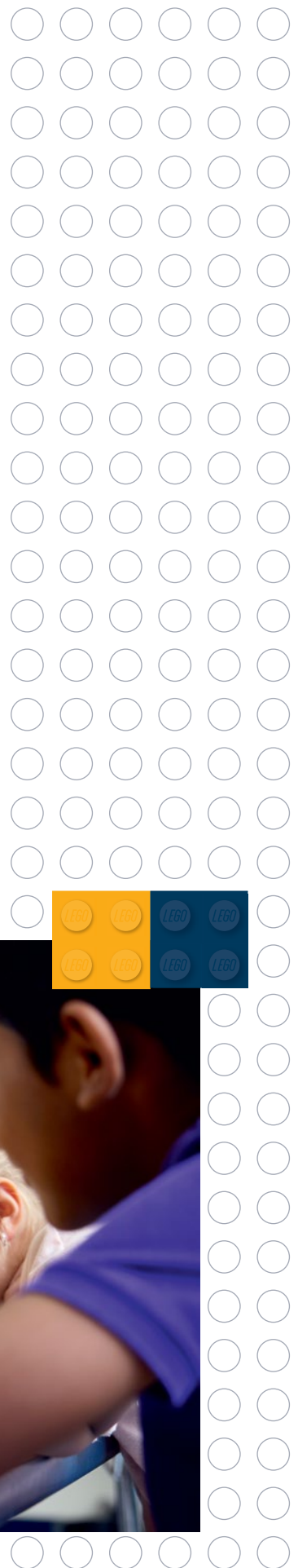
Some students experience linguistic and confidence barriers in the science classroom. LEGO Education Science was intentionally designed with language and learning differences in mind. The hands-on building and classroom presentation include specific features to support all students in accessing the content, as described here by a student (Grade 2 student, TX), "It helps kids who think they're bad at building feel more confident."

As students felt more at ease while working with classmates, teachers observed strong conceptual understanding and concrete application of science. Students were:

- Using academic vocabulary in context,
- Visualizing abstract ideas,
- Applying prior knowledge,
- And transferring learnings across lessons.

This highlights the effectiveness of LEGO Education Science in supporting science learning through inquiry and hands-on modeling. Margaret McCullar (Grade 2 teacher, TX) explained,

"They were getting it. They were understanding that there's an actual scientific lesson going on with their LEGO® [Education sets]."



In student-provided examples from focus groups, students consistently explained science concepts in their own words. Students in grades 1–2 emphasized functionality and concrete properties such as balance and sturdiness, while students in grades 3–8 explained cause-and-effect relationships using concepts such as momentum, friction, and system behavior. For example, when one young student built with LEGO bricks in a lesson, they explained their reasoning behind a design decision as, “If it’s not sturdy, things will fall” (Grade 2 student, TX), while an older student (Grade 4 student, PA) practiced mechanistic reasoning and using scientific vocabulary by hypothesizing, “It slowed down from the momentum.”

Middle schoolers extended vocabulary to systems thinking, integrating environment, cause, and constraint. For example, in a lesson students were asked to elaborate on their learning by designing a way to help salmon migrate upstream, one student (Grade 6 student, TX) explained, “The salmon can go up the slide

because of the water current.” Narrative storylines like ones from lessons “Save the Salmon” (grades 6–8) and “Troll Under the Bridge” (grades K–2) piqued students curiosity and encouraged them to use their imaginations—the salmon need their help swimming upstream and the goats need help crossing the bridge—this motivated them to understand how systems work.

With LEGO Education Science, students collaborated to build physical models to represent a phenomenon or solve a problem. For example, Courtney Miller (Grade 4 teacher, PA) noted that during the “Deep Down Underground” lesson, students “built layers of land using LEGO [Education] bricks and then ‘dug’ through them to uncover fossils deepening their understanding of Earth’s history.” This experience enabled students to translate abstract ideas into testable, observable outcomes and conceptualize phenomena instead of relying on rote memorization.

Exciting and Interactive Explorations Sparked Student Interest in Science

Storylines and tactile experiences like the ones mentioned above elevated enjoyment and conceptual transfer, making phenomena relevant and memorable. Teachers reported observing consistently high student engagement across grade levels, characterized by focus, enthusiasm, and active participation. Engagement spanned behavioral, cognitive, and emotional domains. Unexpected outcomes sparked curiosity as students were building models using motors and sensors, inviting further exploration.

Students across all classrooms described LEGO Education Science as fun, exciting, and memorable. Not only did the hands-on, inquiry-based format of LEGO Education Science lessons spark curiosity, but it also sustained attention and cultivated a genuine interest in science. Even students who typically struggled with focus or





motivation became active, enthusiastic participants—often asking for more lessons. As one student (Grade 2 student, TX) expressed, “I’d like to do more LEGO [Education] science instead of regular science.”

Student responses to study surveys indicated increased cognitive engagement. In grades 1–2, 79% of students self-reported that they had “a lot” of “focus on the things we’re learning”, which is a key measure of cognitive engagement. Students in grades 3–4 (87%) and grades 6–7 (73%) reported they felt “very” or “extremely” focused during LEGO Education Science lessons.

Students were motivated by the physical experience of touching, moving, and seeing results rather than passive observation. They described LEGO Education Science lessons as “fun”, “different”, and “better than reading”, so much so that many continued building their ideas with LEGO bricks at home or discussed experiments with family.

Hands-on collaboration fostered intrinsic motivation by merging curiosity, agency, and relevance. Students did not separate “fun” from “learning”. Rather, they considered enjoyment as evidence of learning, demonstrating how affective engagement supports cognition. As one student (Grade 4 student, TX) shared, “If we learned it without LEGO [Education], I’d probably forget it fast.” By connecting tactile exploration to authentic problem-solving, LEGO Education Science cultivated early STEM identity and sustained interest, genuine understanding, and memory retention.

Conclusions and Implications

Doing science leads to understanding science. The findings of this case study reveal that LEGO Education Science offers students hands-on and highly engaging learning experiences. Most students across grades reported high levels of engagement, with cognitive and behavioral aspects consistently scoring the highest.

The results of this case study demonstrate that joyful, hands-on learning experienced through LEGO Education Science led to genuine comprehension, while seeing, touching, and testing ideas invited creativity. That creativity evolved into self-directed problem solving and critical thinking, deep understanding, and a stronger interest in science.

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