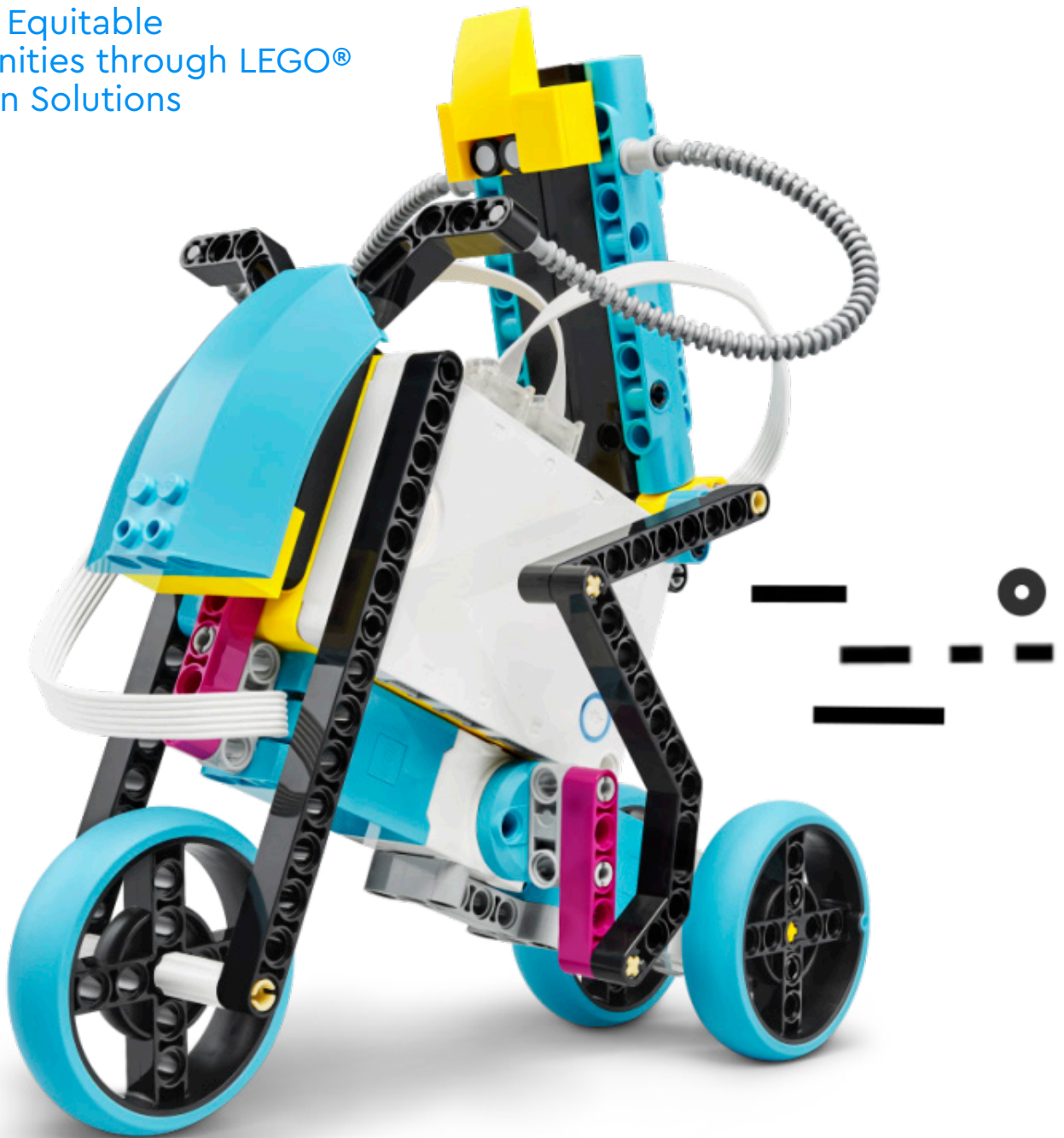


# Advancing Equity and Engagement with Hands-on STEM:

How Two Districts are  
Creating Equitable  
Opportunities through LEGO®  
Education Solutions



Two California school districts — Redlands and Riverside USD — looking to improve equity in access to science, technology, engineering and math (STEM) learning are using LEGO Education Solutions as a district-level approach to reach their equity and learning goals for their students, which are predominantly economically disadvantaged. Early qualitative analysis suggests that LEGO Education Solutions are helping more educators and students access and master STEM topics with the added crucial benefit of increasing student engagement in learning. Students are having fun, which [research](#) shows is linked to academic success. But students who are struggling with academic and behavioral challenges also are engaging with LEGO® Education products and curriculum as readily as other students, and often emerge as leaders in the use of LEGO Education Solutions that combine STEM, coding and manipulatives.

## Challenge: Hands-on STEM is Important, but Unequally Distributed

The connection between student engagement and learning is so [well documented](#) at this point that it might as well be canon law for K-12 educators. Children are more likely to learn and retain knowledge when it's presented in a way that's stimulating,

relevant and fun. The younger the child, the more that instruction looks like what we call “play” — activities that their developing brains read as simply “learning.” Play, according to researchers, is particularly important for developing what Kathy Hirsh-Pasek and Roberta Golinkoff call the [6 C's](#): collaboration, communication, content, critical thinking, creative innovation and confidence. When children are pretending to be astronauts or creating games with elaborate rules, they're really building foundational skills in science and critical thinking that will stick with them forever.

It goes without saying that the same is true for students exploring STEM topics, areas identified by employers as providing the skills needed to meet future workforce demands as jobs become more technical. No less an authority than the U.S. Department of Education has [said](#) that if “we want a nation where our future leaders, neighbors, and workers can understand and solve some of the complex challenges of today and tomorrow, and to meet the demands of the dynamic and evolving workforce, building students' skills, content knowledge, and literacy in STEM fields is essential.” It's imperative that students develop skills in these fields, and they're more likely to do so when they engage in quality activities, with one [study](#) recommending that STEM curricula “[b]e developed with grade-appropriate materials and encompass hands-on, minds-on, and collaborative approaches to learning.” Even before the era of remote learning began in March 2020, districts could choose to purchase any

number of interactive STEM tools — from 3D printers and graphing calculators to LEGO bricks and robotics kits. Today, the possibilities are nearly limitless.

Unfortunately, not all students have equitable access to STEM coursework and hands-on learning across the United States. The reasons vary from school to school — and even classroom to classroom. Sometimes, it's related to budgetary priorities. Other times, teachers are the ones opting out. Perhaps they're intimidated by the technology. Or maybe they believe it's too time-consuming to incorporate the tools into their lesson plans and have limited value to students beyond the fun factor. And in some schools, hands-on learning is used as a reward for students with the best behavior, making them off limits to the students who could possibly benefit from them the most.

The result is a K-12 ecosystem where too few students have access to enriching STEM learning experiences, the kind that could help them find success and reach their potential in school and the workforce. According to a [report](#) from the LEGO Foundation, “learning through play can close achievement gaps between children from more and less advantaged groups, helping all children develop important skills they will need to succeed at any life stage. All students can succeed in play. And all students can enjoy the benefits of learning when they are playing, which can help tackle equity challenges.”

## Solution: Investing in Supports for Innovative and Effective STEM Learning

There are, however, some bright spots where K-12 school districts are prioritizing equity in access to STEM for all students through opt-in grade-level implementation. Two California districts — Redlands Unified School District and Riverside Unified School District, both just east of Los Angeles with about 70% of students that are economically disadvantaged—spent the 2021–22 school year rolling out LEGO Education solutions and building capacity among teachers to incorporate the tools into their lesson plans. Redlands and Riverside used many of the same strategies:

- Because equity is a focus for both districts, both decided that entire grade levels at a school must "opt-in" — meaning that it's only available to schools that decide to make the lessons and activities available to all students. Virtually every school in both districts has at least one grade level participating.
- Both put similar structures in place to train teachers to use hands-on activities that integrate and incorporate STEM.
- Both provide teachers with a combination of LEGO Education resources and district-augmented materials, like slide decks, which they can edit (with help from district edtech specialists) to tailor to their specific lessons.
- Both are acting on compelling research that shows not just the power of play, but the ways in which play can deepen STEM learning and the foundational skills for long-term success.
- Both are creating a sustainable infrastructure where many students have access to LEGO Education kits, but does not require a 1:1 purchase.
- Both are building equity by finding ways to make these tools accessible to more students, and by unlocking their potential to learn through a new type of instruction.
- Both are reigniting a passion for learning. Now more than ever, we need students — and their teachers — to be excited about learning.

### Here's a more detailed look at how each district structured their initiatives:

#### Redlands: 'Equitable access to all students'

Redlands USD, which serves over 20,000+ students in 24 schools across Redlands and Loma Linda, is using LEGO solutions in 15 of its 16 elementary schools, where teachers are incorporating the lessons into multiple subject areas for grades K through 5. The initiative fits with the district's goal of putting technology into the hands of all students. Oliva Davison and Jen Hunt are educators on assignment as the Innovation Specialists for the district. They are responsible for the district's implementation and deployment of LEGO Education Solutions and supporting teachers in their classrooms.

Redlands used some of its ESSER/ARP funds to buy a variety of LEGO Education solutions, including LEGO Education SPIKE™ Prime and LEGO® Education SPIKE™ Essential. Each of the district's schools is autonomous,

which means each school could theoretically purchase and integrate different edtech solutions into their classrooms. Before this initiative, whether a student received access to tools that developed science, engineering, coding and robotics skills was left to chance. When the district decided to purchase LEGO Education solutions, the district-wide technology team took a more structured approach, making sure all students would have access to tools that develop science, engineering, coding and robotics skills.

Initially, the Redlands leadership planned to bring teachers together in a professional learning network that would meet once a trimester. Due to substitute shortages related to COVID-19, however, that plan had to shift. Instead, the two Innovation Teacher leads go to



each site individually to work with teachers in groups by grade level. With each group of teachers, Davison and Hunt walk through LEGO Education lesson plans, modifying as needed to connect to specific standards or teacher interests. Redlands also attributes early success to the professional development principals went through on LEGO Education, where they experienced model lessons and hands-on usage. "Once the principals took the training, they realized that what might look like play is more than that. It's learning through play. Sometimes teachers worry that a principal doesn't understand that what they're doing is really learning — by having all the principals participate in LEGO® Education Teacher Training training, we've taken that worry away," said Davison.

While it's been more work than anticipated to deliver customized professional development at each school site, Davison explained that, "Our position is part of what is making this work. We are classroom teachers, but right now we are in this position to be dedicated to help teachers. So when we talk about tailoring to teacher needs — because we are teachers, we really know how to do that." This year is a baseline year for the district in terms of gathering data on the impact of LEGO Education, but it's "encouraging to see the creativity emerging from both teachers and students," shared Jennifer Hunt. One teacher encouraged students to build Hoppers with SPIKE Prime and raced them in a competition. Hunt said the teacher even created a NCAA Tournament-style bracket to track the winners. The same class created a Dancing with the

Robot Stars event where students created breakdancers one day, then created a flash mob that had to dance in sync. Although robots were 'dancing' in both lessons, it involved different skills; students had demonstrated their creativity and unique coding for the first day, but then had to work together as a class to ensure the flash mob was operating in tandem.

The team is now aligning lessons to the state's Next Generation Science Standards and district-specific STEM goals so "it's something that teachers are using as a part of their learning and not something that just seems like it's additional work" for them, said Olivia Davison, a former science teacher who now serves as one of the district's innovation specialists. For example, the fourth grade Carnival Games LEGO Education lesson aligns easily with part of the 4th grade science standards on energy, and the district is taking advantage of this connection to implement a pre-test and post-test next year to assess how using LEGO Education might support student mastery of the science content. The district is also working on its vertical alignment so that each LEGO Education activity can build on the previous one, and ultimately reach the kind of progression that Hunt and Davison believe will reap real rewards.

Most grade levels are opting to use the tools, according to district-wide technology staff, because of their fit within the curricula, their ability to scaffold and their knack for engaging students. Teachers are also doing a good job of integrating the tools into everyday classroom activities, something that builds equity in access, said Jen Hunt, who is also a district-wide innovation specialist. The more lessons that teachers try, the more lessons they want to do, because they are seeing positive outcomes for their students and can be embedded and scaffolded into existing lesson plans or as stand-alone activities. Because every student in a grade has the opportunity to use these tools — rather than those being rewarded for good behavior or academic performance — all students have the chance to be successful at something new.

"We're really trying to push away from the idea that LEGO Education products are for Fun Friday or a reward for the early finishers," Hunt said. "We're trying to

make it part of the curriculum, and every student needs access to it ... because students are really engaged and teachers are seeing progress, especially as students are re-learning how to work together and collaborate."

Davison shared one story to illustrate the trend they are seeing with collaboration: "One student, a 5th grader, was working with SPIKE Prime. But the first day, his partner wasn't there so he had to work on his own.

He was so determined to get his build right — but he struggled. He didn't have much prior use of LEGO bricks like some of the other kids. When we came back a few days later, this student was so excited to tell us he won 3rd place in the Hopper race! But what was even more exciting was that once his partner returned, the student took on a leadership role to bring his partner up to speed, and teach him what the student had worked to learn on his own."

### Riverside: 'We need to get them excited'

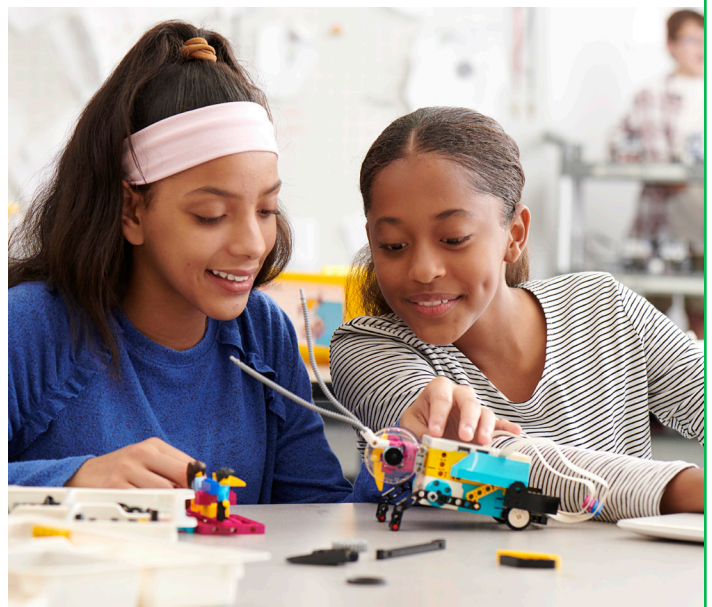
A few miles southwest of Redlands, Riverside USD decided to use LEGO Education solutions to reintegrate students into brick-and-mortar schools at the end of pandemic restrictions. Riverside USD serves nearly 40,000 students across 50 schools. "The kids didn't have the chance to be collaborative and really needed to re-learn how to communicate," said Glae Koenig, one of three of the district's STEM teachers of innovation. So Riverside stocked all 30 elementary schools with 20 sets each of SPIKE Essential and SPIKE Prime — enough for two classes to check out the kits at the same time. The kits are not intended to be a one to one model. Many students benefit from use of the kits across multiple schools and classrooms, so there is not a need for every classroom to purchase. Instead, the district has created an infrastructure to 'rent' or 'reserve' the kits by teachers, so there is both flexibility and consistency in usage.

What looks to the world — and to students — like a game is actually learning disguised as fun. "You may think you're playing with [LEGO bricks] today," Koenig imagines telling students, "but we're doing a science lesson that includes this vocabulary and these standards."

Teachers are getting more accustomed to using the tools in their classrooms. Every school employs a STEM lead to share information with teachers, which helps teachers integrate the tools into their lesson plans. Koenig said the use of LEGO Education tools has varied across schools. The support provided through site STEM leads

has supported the information sharing across schools and classrooms, as well as fidelity of implementation. The experience even inspired Riverside to begin creating a STEM conversation guide for students and their families to connect the dots between hands-on activities, student engagement, and learning objectives.

Throughout the 2021–22 school year, the Riverside team has been working on a district-wide STEM plan that includes guiding documents for what STEM looks like in the district across grade levels. But this document was always going to be an internal-facing product, and district staff realized they also wanted a public-facing document that families could use. Steve Kong



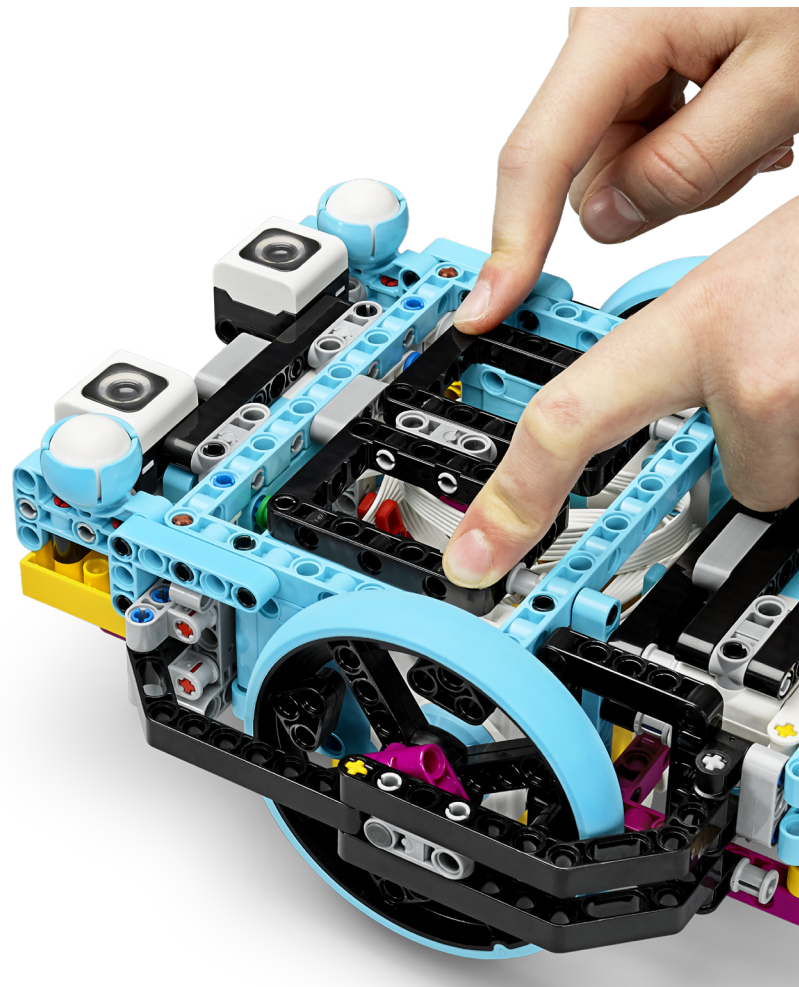
explained, "We knew families don't care about nuts and bolts, about why we have a scope and sequence. They want something relevant they can use as a family." The district is producing a STEM guide focused on careers and industries aligned with CTE programs offered at various district high schools, with the goal of helping students identify potential career paths, understand the credentials required for those career paths, and consider which district high school may be the best fit. As Christalle Hart explained, "We're preparing kids to be world-ready, not college-ready. Next year, we're planning family nights which will bring together the STEM guide with LEGO Education-based activities."

During the 2021-22 school year, more than 5,000 students experienced the LEGO Education lessons,

which were modeled and adapted by STEM leads for teachers in their schools. Next year, each school will put 40 SPIKE Prime and SPIKE Essential tools in those schools. The goal is to make students creators of educational content, rather than simply consumers of it. It also gives them a chance to experience the joy of learning once again, something that many kids missed during their time away from the classroom. This was made possible by teachers having the necessary supports — ready-made activities, LEGO Education lessons and time during the school day — and students having the time and space to learn through play.

"We need them to get excited about learning," said Koenig. "When they're having fun and working together and don't even realize that it's a lesson, that's magical."

**Student Spotlight on Hopper:** "It was awesome even though me and my teammate had a little trouble we eventually made him move. What's best is that we had lots of fun making him and when we got him to do what we wanted we were super happy! This project includes [using the SPIKE PRIME and working with] a teammate, consistency, your brain and patience. If you really like coding this is highly recommended!"



## Call To Action: All Students Call To Action: All Students Need Access to Hands-On STEM

If there's a common theme among Redlands USD and Riverside USD, it's the impact hands-on learning is having on students — all students — but especially those who struggle either academically or behaviorally. Teachers in both districts say the tactile, interactive nature of LEGO Education solutions provide a new way for kids

to demonstrate what they've learned and where their talents lie. "Because of the immediate feedback that the LEGO Education kits give them, these kids are feeling like they've accomplished something for the day and that they were successful," said Davison from Redlands USD. "They're also proud of their work, because it's not something that's common for them to be doing."

While neither district has fully developed how to assess the outcomes of their initiatives, both see signs that the work is having a positive impact on students, particularly in the area of social-emotional learning. Students are learning more about

the importance of collaboration and communication, something the district is tracking informally through self-perception exercises before and after the activities. **After conducting model lessons, Redlands USD surveyed students. Of the K-2 students surveyed, 93% said they "liked it a lot." And 94% of third- through fifth-graders said they would recommend LEGO Education lessons to others.**

These districts are validating that hands-on, collaborative learning is critical to support engagement and social-emotional development, and that these lessons will support long-term academic gains in STEM.

### Conditions for Success

- 1 District prioritization** — articulate goal(s) for STEM and strategies for teacher and student engagement, allocate and distribute resources.

Redlands USD and Riverside USD leaders have articulated STEM as a priority for their districts. This includes a multi-year strategy, purchasing LEGO Education Solutions and allocating central office staff to support implementation.

- 2 Scaled, optional implementation** — allow and support teachers to opt-in, and set expectations for buy-in.

Both districts set requirements related to grade-level or school-wide opt-in to ensure fidelity and equity in access for students.

- 3 Teacher supports** — provide turnkey lessons for teachers and opportunities for training and modeling lessons.

Teachers were provided ready-to-use and/or augmented lessons from LEGO Education by their district for ease and immediate implementation.

- 4 Define success** — identify metrics and measures for success to demonstrate short- and long-term outcomes.

Both districts are continuing to develop metrics for student success. Redlands USD is using a post survey about student engagement and learning, and developing standards-aligned science tests. Riverside is also developing pre- and post-tests for next year.

## Acknowledgements

LEGO Education is grateful to the leaders and educators in Redlands Unified School District and Riverside Unified School District for contributing their experiences and spotlighting their successes and aspirations for creating equity in STEM opportunities.