

# CASE STUDY

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NATIONAL  
INSTITUTE  
*for*  
**STEM**  
EDUCATION

## LISD TAKES AN INNOVATIVE, COLLABORATIVE, AND SYSTEMIC APPROACH TO IMPLEMENTING STEM

Lewisville Independent School District (LISD)

Exceptional leadership, hands-on instruction, an evidence-based framework, and ongoing professional development result in more than 60 STEM-certified teachers and 3 STEM-certified campuses

STEM

## *District*

65 SCHOOLS

PREK-12

52,368 STUDENTS

## *Students*

10.4% AFRICAN AMERICAN

0.4% AMERICAN INDIAN

13.7% ASIAN

29.1% HISPANIC

0.1% PACIFIC ISLANDER

42.8% WHITE

3.6% TWO OR MORE RACES

32.2% ECONOMICALLY DISADVANTAGED

16.5% ENGLISH LANGUAGE LEARNERS

11% SPECIAL EDUCATION

Studies have identified the elementary years as the period when students form their interests in STEM identities and careers (source: Successful STEM Education, an initiative of the National Science Foundation). Furthermore, the elementary years are a time when fundamental habits of mind form. Attributes of a STEM mindset—such as productive failure and critical thinking skills— influence the lens through which students continue to view learning and the world.

To start students on a successful STEM path early, LISD recently launched a STEM Academy program. When the first LISD STEM Academy opened at Donald Elementary in August 2018, students and parents immediately embraced the hands-on, collaborative learning environment dedicated to teaching students STEM skills. The program's popularity in the LISD community has led to its expansion to other elementary campuses. The LISD STEM Academy at Polser Elementary and LISD STEM Academy at Valley Ridge Elementary will open in 2019-20. The district plans to open additional STEM Academies in the coming years.

Combined with other initiatives, such as national STEM certifications for teachers and campuses, engineering every day for every student at STEM Academies, STEM Enrichment programming at several non-STEM Academy campuses, and inquiry-based instruction and hands-on learning for all students, LISD is taking an innovative, systemic approach to STEM—and providing its elementary students with limitless opportunities.

## CREATING A COMPETITIVE EDGE AND PREPARING STUDENTS FOR THE FUTURE

“In public schools, we face competition,” said Jonas Greene, EdD, elementary STEM administrator for LISD. “Parents have choices in the education of their children, and there are charter schools and private schools that offer STEM programming. To maintain a competitive edge, we have to design and develop programs that provide rich learning opportunities for students.”

The district surveyed parents and found that the vast majority wanted to see an increase in STEM programming in LISD.

“National trends also show the STEM job market is increasing exponentially, but students are not always prepared to pursue those careers,” said Greene. “Our district goal is that all of our students enjoy thriving, productive lives in the future, so we want to make sure the programs we create are preparing them for that future.”

All of these factors ultimately led to Lewisville ISD designing and developing its first STEM Academy.

## PREPARING FOR THE FIRST STEM ACADEMY

LISD is a suburban district located just north of Dallas. It serves more than 52,000 students and grapples with the same educational challenges facing many districts. More than 36 percent of LISD students are identified as at risk of dropping out of school, 32 percent are economically disadvantaged, and 16 percent are English language learners.

LISD began preparing for the opening of its first STEM Academy at Donald Elementary about 18 months in advance, working with campus leaders, teachers, parents, and the community. During this time, Dr. Greene, who is an expert at integrating district and external resources for the benefit of LISD students, explored how to best support the transition to a STEM focus at Donald Elementary.

“We wanted to assure our community that our STEM Academy would be built on research and best practices in STEM, and that it would be vetted and recognized nationally by an outside organization,” he said.

Working in collaboration with Superintendent of Schools Dr. Kevin Rogers, the Lewisville Board of Trustees, and campus principals and teachers, Greene initiated a partnership with National Institute for STEM Education (NISE) in 2017.

NISE certifies teachers and campuses in STEM teaching, culminating in the National Certificate for STEM Teaching (NCST) and the National Certificate for STEM Excellence (NCSE)–Campus Certificate. NISE integrates the most recent research and best practices in STEM with professional development that is research-based, personalized, and immediately applicable in the classroom. It provides an evidence-based framework for defining and understanding STEM, and focuses on high-impact STEM

instructional strategies that work synergistically across content areas in preK-12 classrooms.

“Our partnership with NISE goes hand in hand with the implementation of our STEM Academy program,” said Greene. “The NISE certification process offers teachers professional learning and best practices in STEM education. It also provides accountability so our community knows that an LISD STEM Academy is not just something we labeled ‘STEM’ but is recognized by a national organization.”

## EARNING TEACHER AND CAMPUS CERTIFICATIONS

During the 2017-18 school year, 22 teachers at Donald Elementary completed the NCST. The NCST is an online, competency-based professional development program for K-12 teachers. With the support of a virtual STEM coach, teachers developed digital portfolios demonstrating their understanding of 15 STEM Teacher Actions across three domains that are essential for effective STEM teaching: Creating an Environment for Learning, Building Scientific Understanding, and Engaging Students in Science and Engineering Practices. At the same time, the school completed its requirements for the NCSE–Campus Certificate, developing a digital portfolio demonstrating the application of the 15 STEM Teacher Actions.

In May of 2018, the LISD STEM Academy at Donald Elementary became the first elementary school in Texas to earn the NCSE–Campus Certificate.

“For us, the NISE certification process was about digging deeper into what STEM truly means and what that looks like in the classroom,” said Michelle Wooten, principal of Donald Elementary. “The certification process took things much deeper than a textbook could. It helped us gain a different perspective on STEM education. It allowed me to look into our classrooms with a different lens that’s more inquiry-based, and it helped me set STEM goals for our campus that are much more specific. It helped our teachers develop their STEM teaching skills and become better equipped to provide opportunities for students across all of those disciplines—science, technology, engineering, and mathematics.”

## MEETING EDUCATORS WHERE THEY ARE

In LISD, anyone working at a STEM Academy campus can sign up for the NCST, once again illustrating the district’s commitment to STEM and its teachers, campus leaders, and students.

“It’s all voluntary. Teachers are way more interested in earning certification than we ever imagined. To date, more than 60 teachers have gone through the process. When you leave it up to people being intrinsically motivated to learn, it creates more interest than if we’d required them to get the certification,” said Greene. “All of the principals, assistant principals, and instructional coaches at the STEM Academies have gone through the certification process, too, and they worked alongside the teachers.

It's helpful for them to know what teachers are learning so they can support them in the learning process as well as implementation. Plus, having a dedicated STEM coach from NISE means that teachers can work with and receive feedback from an outside person who's not their supervisor or evaluator. This feedback helps them create and think about things in their classrooms in a different way. It's a rich learning experience."

## KEY DIFFERENCES AT A STEM ACADEMY

LISD cites two major differences between a STEM Academy and a non-STEM Academy campus. The first difference is that a STEM Academy integrates STEM practices into all instructional areas, creating an integrated STEM program that students experience all day long. This STEM+ (plus) model complements the instructional strategies that teachers implement and hone while earning the NCST. As part of this STEM+ model, STEM practices are integrated into the core content areas of language arts, math, science, and social studies, as well as special areas such as physical education, art, and music. In addition, students experience instruction in engineering, robotics, computer programming, and career exploration. In fact, the instructional hours for a STEM Academy are 25 minutes longer than a typical LISD school day to allow for additional STEM learning experiences.

As part of the integrated STEM curriculum, students learn content through project-based learning experiences. "We integrate inquiry-based learning and problem-solving across the content areas. Here again, the direction of the district aligns nicely with that of NISE."

The second key difference is that STEM Academy campuses provide instruction in engineering every day for every student. Since there were no state standards for engineering in the elementary grades, LISD designed its own. Further, its engineering challenges incorporate grade-level standards from other core subjects as well.

"Over the years, educators have recognized the ability of STEM education to transcend the content areas of science, technology, engineering, and mathematics. In the design of our STEM academy model, we chose the STEM acronym since it is the most universally accepted acronym. We added the 'plus' to recognize the importance of bridging concepts into other content areas," said Greene.

## BUILDING A COMMON VOCABULARY FOR STEM

"Having a common vocabulary through NISE and the 15 Teacher Actions helps us talk about what we really mean by STEM in our STEM Academy program," said Greene.

"For example, before we began working with NISE, there were misconceptions about 'integration' being the same as 'replacement.' So, many teachers thought that if they did an engineering task, then they didn't have to teach science that day. But skill-building in science is critical to the engineering tasks students are working on. Integration is not about replacing; it's about making connections from one content area

to another. Having this common vocabulary helps us ensure that every stakeholder in a STEM Academy is on the same page.”

## TEACHING STEM AT NON-STEM ACADEMIES

In addition, LISD offers STEM Enrichment programming at several non-STEM Academy elementary campuses. STEM Enrichment occurs once a week during the specials rotation. Students’ learning experiences include engineering, robotics, computer science, and computer programming.

“We implement the same philosophy, concepts, and curriculum from our STEM Academy program at our other campuses,” said Greene. “The difference between these specials rotations and the academies is that the specials rotations serve as an enrichment to students once a week and the academies provide this instruction every day to every student.”

## SUPPORTING HANDS-ON, INQUIRY-BASED STEM LEARNING FOR ALL K-8 STUDENTS

Although the STEM Academy program and STEM Enrichment programming are more recent additions in LISD, inquiry-based instruction has been a district focus for years.

“When our district launched an initiative for inquiry-based instruction several years ago, the only science resource we had adopted for our elementary schools was a textbook,” said Greene. “We have a teacher committee that selects curriculum resources, and every teacher hands-down chose STEMscopes™ Texas above all the other resources we reviewed. Not only is it standards-aligned and inquiry-based, but it’s available in both English and Spanish.”

LISD uses STEMscopes Texas as its core science curriculum in grades K–8, as well as a Spanish–language version available for grades K–5. STEMscopes Texas is built from the ground up to address the Texas Essential Knowledge and Skills (TEKS) for Science. It combines a comprehensive digital STEM curriculum, supplemental print materials, and hands-on exploration kits with embedded professional development to support student and teacher success.

“STEMscopes is the foundation of our 5E model, which occurs every day in every classroom,” said Greene. “With STEMscopes, students learn about concepts first-hand as opposed to just reading about them. We know from research that when students have experiences, they remember things longer. So, starting with a hands-on activity is critical to the success of science learning. We also know that once students have had those experiences, they need to process that information. STEMscopes provides all of that in a one-stop shop. It gives students hands-on experiences, which they really enjoy. Then after they see something happen in an investigation or experiment, they can dive deeper into the scope to find out why that phenomenon occurs.”

In addition, tools such as professional development videos, on-demand webinars, and how-to guides help teachers continuously improve their teaching.

“We integrate the STEMscopes teacher resources into our curriculum. If, for example, we plan to do a specific investigation with students, we’ll include the investigation set-up video as part of that. It helps teachers streamline their planning, so they can picture what things will look like before teaching them to students,” said Greene. “With the STEMscopes curriculum and kits, we’ve seen an increase in hands-on instruction across our district.”

## STRENGTHENING STEM INSTRUCTION AND OUTCOMES

With the ongoing support of Greene and other district leaders, LISD teachers and campuses are strengthening STEM instruction and outcomes.

### *Streamlining the replicability of the STEM Academy program*

“Having a streamlined method of professional development and curriculum development, which is the result of our schools’ work with NISE, has helped streamline the replicability of our STEM Academy program from one campus to another. While each campus has its own personality and culture, the NISE certification process helps us ensure that the STEM Academy program offers the same quality and standards no matter which campus you’re on,” said Greene.

The STEM Academy program, which is an LISD school choice program, has also attracted new students, resulting in increased enrollment at the three elementary schools. During the application period for the 2019-20 school year, parent information sessions were attended by more than 400 families, and the district received applications for more than 450 students.

### *Getting students and teachers excited about school*

“While our first STEM Academy just completed its first year of operation, we are seeing positive changes,” said Greene. “Some highlights are that students are showing more creativity and critical thinking. They’re excited about learning and enjoy going to school. That’s really our end goal in all of this—not to improve a test score but to create engaging learning experiences that help students develop creative thinking and problem-solving skills.”

“Each teacher who became certified took away something different based on what they teach, whether it’s art, science, math, or language arts,” said Wooten. “We’re proud to be STEM certified, and we’re grateful for the opportunity we’ve had. It’s something that everybody will benefit from—our teachers, students, and parents. We look forward to seeing where the future takes us.”