



Charting a New Course

**AN ARKANSAS STEM ACADEMY'S ROADMAP
FOR SUCCESS**

STEM framework and standards provide clear guidelines for continuous improvement



Photo courtesy of the Forest Heights STEM Academy

Interest in STEM (science, technology, engineering, and math) education has been building since the early 2000s. The modern labor market is fueling a growing demand for STEM skills even outside of fields traditionally perceived as STEM-related. STEM education hones students' critical thinking, problem-solving, and analytical abilities, all of which are crucial for making informed decisions, solving everyday challenges, and better understanding complex technological and environmental issues.

The need to prepare students to navigate the world around them and ready them for the current and future workforce has spurred the enthusiasm for STEM instruction. As the National Science and Technology Council's Committee on STEM Education stated, "Now more than ever the innovation capacity of the United States—and its prosperity and security—depends on an effective and inclusive STEM education ecosystem."

However, the concept of STEM education is relatively new (even the acronym has only been around since 2001). Students and teachers are used to treating math, science, and other subjects as discrete areas of knowledge rather than as an integrated discipline. Therefore, many schools need a roadmap for supporting and refining the implementation of STEM instructional strategies, best practices, and learning environments. For that roadmap, Forest Heights STEM Academy in Arkansas turned to Cognia®, a nonprofit, nongovernmental organization that focuses on continuous improvement and provides accreditation and certification services to primary and secondary schools globally.

Located in the Arkansas state capital of Little Rock, the K-8 specialty school attracts students from all parts of the Little Rock School District. Almost half (48%) of Forest Heights' more than 700 students are low income and more than half (56%) are African-American.

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Figuring out the starting point

Forest Heights has a stellar academic reputation; the percentage of the academy's students scoring as Ready or Exceeding on state assessments is on par with, and frequently surpasses, district and state averages. However, Dr. Amber Harbin, the academy's former STEM coordinator (now a science specialist for the state department of education), explained that the academy had few models of what STEM education should look like.

"We were going along without any true roadmap," she said. "We all had ideas about what we thought STEM education was, but we didn't have access to program information or any kind of rubrics or checklists of what we should be including. We needed some way to assess what we were doing and some direction for how we could improve and provide the best opportunities for students."

Dr. Harbin found what she was looking for at a conference where she met a Cognia representative and learned about the nonprofit's STEM certification process. She was especially intrigued by the idea of having a research-based framework and criteria for supporting the continuous improvement and assessment of Forest Heights' STEM programs.

During the 2019–20 school year, the academy staff began the certification process. However, school closings due to the 2020 COVID-19 pandemic caused a chain of delays. Once schools and organizations reopened, the process took longer than usual due to pandemic-related setbacks. As a result, the academy completed its certification process in the 2021-22 school year.

As part of the data collection process, Dr. Harbin created a Google Drive where educators could upload the data and artifacts of in-class and extracurricular STEM learning. She and Forest Heights' STEM committee determined what information fit the different parts of a Cognia-provided rubric.

"The rubric gave us an outline of what we needed to be doing," said Laura Gowan, Forest Heights' current STEM coordinator. "And it also let us know that we were already doing great things." In addition, Gowan noted that the rubric highlighted the need for Forest Heights educators to categorize their efforts and share the information amongst themselves. "For example, seventh graders might not necessarily know what kindergarten is doing," she explained.

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“As a K-8 school, we're basically two schools in one, and in our efforts to keep the traffic physically separate, we sometimes can end up isolating the kindergarten and the upper grade teachers,” said Assistant Principal Barbara Kirkpatrick. “But every year builds on the previous ones. Our principal, Amy Cooper, always says that if our kids come to us and they don't have the skills we need, we can't blame it on the school across the street. We have to look down the hall.”

Kirkpatrick reported that many teachers had forgotten about the projects and activities that they had created over the years. “So, it was a good reflection for our staff too,” she said. “It really helped us see what we're doing, and that we're doing a good job of it.”

The review team's evaluators also interviewed faculty, students, and other stakeholder groups such as parents and community members. Kirkpatrick was especially impressed at the insights obtained from the students. “The kids were really, really good about taking the time to think deeply about the questions they were being asked,” she said.

Gowan was also impressed. “I had the elementary students in my classroom for the interview process,” she said. “Listening to the impact that STEM had made on them and the different projects and activities that they were able to speak on was an eye-opening experience. And some of these students were as young as kindergarten!”



Photo courtesy of the Forest Heights STEM Academy

Signs of high-quality STEM instruction

As part of the certification process, Cognia's review teams rate how well schools are meeting the STEM Certification Standards in Cognia's i3 Rubric. The highest rating is "Impacting," which means best practices are deeply entrenched in every part of the institution's culture. The second highest rating is "Improving," which means the institution is meeting Cognia's standards and is in the process of refining and embedding best practices.

In its 2022 certification review, Forest Heights scored as "Improving"—the second highest level—in all but one of the standards in Cognia's i3 Rubric (the one exception received the highest score possible—"Impacting"). Kirkpatrick reported that once the academy's educators looked at all the data and the rubric, it became clear where they needed to improve and where they were doing well.

While Forest Heights educators had already implemented several best practices, the review team provided recommendations for refining or expanding on those practices. In addition, educators came up with their own ideas upon reading the review team's final report.

Problem-solving

During interviews, parents related how their children had become so used to problem-solving that they were applying the skill at home (e.g., using wire, a battery, and a light bulb to create a light source during a power failure). One elementary student described how, when confronted with a math problem, she could consider which of multiple strategies would help her achieve the result she wanted.

The review team recommended cross-curricular problem-solving activities. When students are required to adopt multidisciplinary approaches to addressing challenges, they become more adept at "connecting the dots" between different disciplines and can hone critical thinking and problem-solving skills more effectively. Evaluators suggested that Forest Heights teachers use some professional learning community time to collaborate across disciplines and identify real-world problems for students to solve.

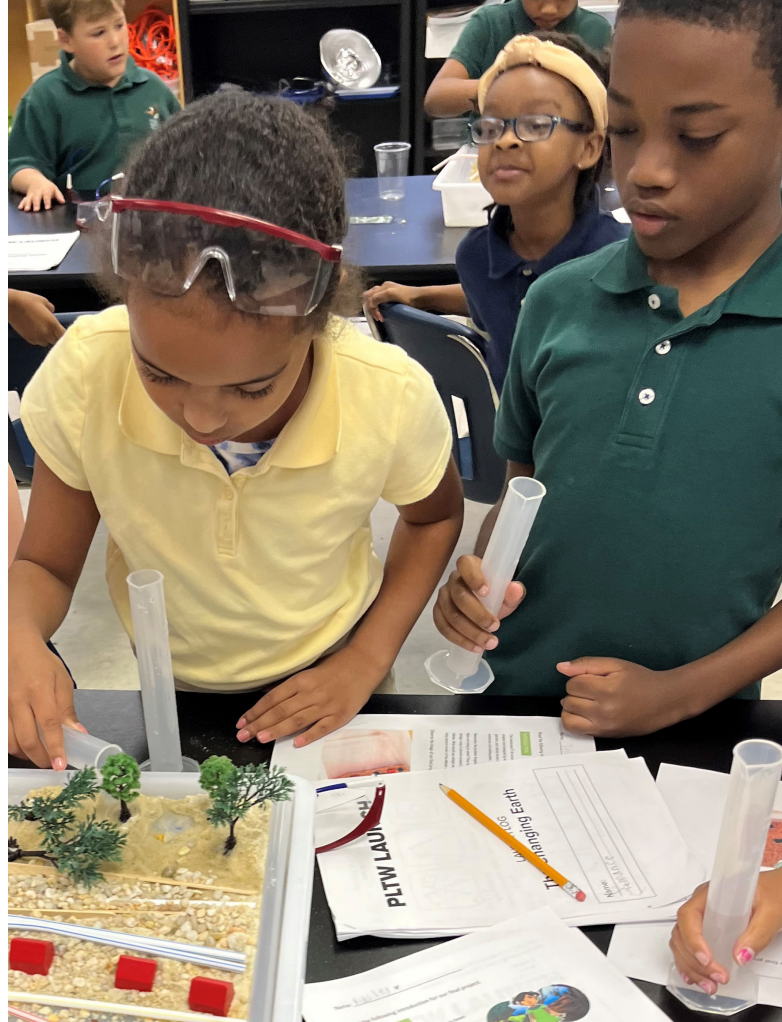


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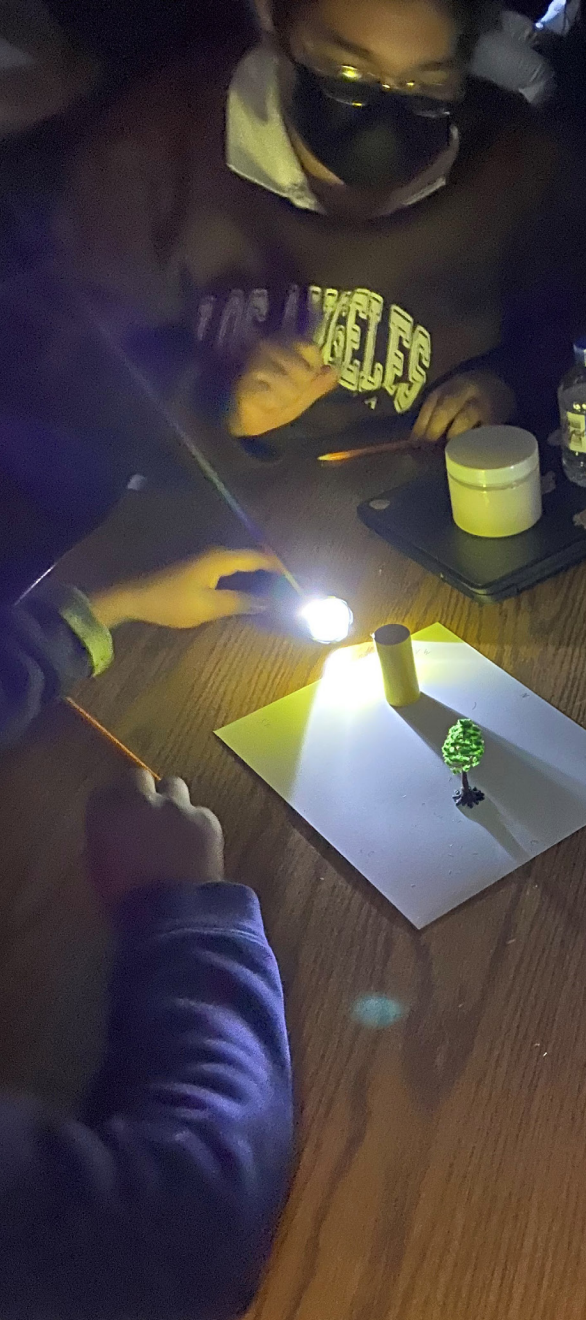


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Inquiry-based learning

Inquiry-based instruction develops students' scientific inquiry skills such as observing, hypothesizing, experimenting, collecting and analyzing data, and drawing conclusions. In addition, the approach promotes students' critical thinking, problem-solving, active engagement, and passion for learning.

Forest Heights supports inquiry-based teaching by making the 5E instructional model part of teachers' initial STEM training. The model consists of five phases:

- **Engage** - spark students' interest in the concepts that will be covered in the unit
- **Explore** - have students investigate the concepts in a hands-on manner
- **Explain** - ask students to share what they learned during the Explore phase and provide clarifications as well as technical information
- **Elaborate** - give students an opportunity to deepen their understanding by applying what they learned
- **Evaluate** - assess whether students have fully grasped the concepts

Teachers reported that they became more confident as they continued their use of the 5E model. However, the review team noted that some teachers used the model more consistently than others and recommended that all staff incorporate it into classroom instruction.

Equitable learning

The academy leadership had noticed that female students were following a national trend of high STEM performance in the elementary grades but lagging in the middle grades. To counter that trend, the academy started STEMinistas, an afterschool science program for girls. In addition, two of the three teachers in the middle school's Project Lead the Way curriculum are women. "We need to show girls exactly what they can do," stated Kirkpatrick. "We're very intentional about making sure that we have role models for all of our students here at Forest Heights."

Additionally, educators made a special effort to reach out to gender and ethnic groups that are typically under-represented in activities such as the academy's afterschool robotics teams. "We had some of the other clubs share the news about this STEM program," said Assistant Principal Ashley Harris. "We made a conscious effort to be more inclusive by making sure that students were aware of what we had on campus." As a result, the robotics teams are now representative of the academy's student population. The certification review team gave Forest Heights high marks for the focus on equitable opportunities. The evaluators recommended the development of a formalized process for examining equity data in all subgroups and also advocated for an increased focus on students with disabilities.

Academy leaders are planning to create model classrooms so teachers can see what a STEM academy classroom needs at each grade level and content area.

Professional learning

Professional learning is a high priority for Forest Heights. Teachers engage in weekly professional learning by grade level, content, or in professional learning communities. In addition, instructional coaches help teams of teachers move through a cycle of learning, applying, and reflecting. The academy also offers schoolwide content area professional development, with teachers engaging in training programs and strategies such as Mystery Science, Project Lead the Way, Claim Evidence Reasoning (CER), and Argument-Driven Instruction (ADI).

Forest Heights goes beyond those professional development initiatives by providing teachers with out-of-school “Extern” experiences in which the teachers gain real-world STEM content knowledge from individuals in the STEM industry. Over the past few years, academy staffers have toured a submarine as well as an agency that brokers electrical power for Little Rock. A bonus is that teachers are continually learning about field trip options.

The certification review team recommended implementing a formal process for evaluating the impact of professional learning on instructional practice and student learning. Forest Heights administrators also received feedback that while they had a general classroom walkthrough tool, a STEM-specific walkthrough tool would be advisable. In addition, academy leaders are planning to create model classrooms so teachers can see what a STEM academy classroom needs at each grade level and content area.

Distributed leadership and a shared vision

Forest Heights leaders have developed a “Blueprint” that has enabled them to establish a shared vision for STEM with all the academy’s stakeholders. In addition, they have created distributed models of leadership for planning, implementing, and sustaining STEM programs and practices.

For example, since 2017, the academy has had a STEM committee that serves as a forum for ideas. The committee includes administrators and teacher representatives from all grade levels as well as representatives from roles not normally considered STEM-related (the library, physical education, music, and social studies). The committee’s interdisciplinary nature facilitates looking at STEM via a variety of different lenses.



Photo courtesy of the Forest Heights STEM Academy

Similarly, the academy's leadership team consists of more than school administrators. It includes the STEM coordinator, K-4 and 5-8 instructional facilitators, and the parent involvement coordinator. Input from these leaders has led to modifications such as more STEM-based electives, accelerated courses, and a science lab.

The certification review team gave its stamp of approval to Forest Heights' approach and recommended that the academy continue to use distributed leadership.

Moving toward the future

Dr. Harbin sees the certification process as providing Forest Heights with a roadmap for improvement. "It gave direction," she said. "Once we found out the criteria for a quality STEM program, we were able to focus what we were doing and develop new strategies. The goal going forward will be to get everybody educated on that process."

Harris, Kirkpatrick, Gowan, and the rest of Forest Heights' faculty are looking forward to applying all they learned from the review process. "Initially, we wanted to do this so we could be certified," said Kirkpatrick. "But the big picture is, we want this for our students. We want to improve our students' experiences and their knowledge of STEM and STEM careers. It's really about the kids. They're the ones that get the big payoff."

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About Cognia

Cognia® is a global, nonprofit improvement organization dedicated to helping institutions and other education providers grow learners, teachers, and leaders. Cognia offers accreditation and certification, assessment, and professional services within a framework of continuous improvement. Serving 36,000 public and private institutions from early learning through high school in more than 90 countries, Cognia brings a global perspective to advancing teaching and learning.

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