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STEM School Chattanooga

Where Three Tenets Build Four Years of Transformation

Chattanooga, Tennessee · Public Magnet School · ~300 Students

“I spoke at our state of education event last year, where I went up in front of district leaders and talked about how amazing my school was. I look at myself now, and I just have so much pride in how far I’ve come.”

— Emma, Senior

STEM SCHOOL CHATTANOOGA

School Snapshot

Location	Chattanooga State Community College campus, Chattanooga, Tennessee
Type	Public magnet school within Hamilton County system, lottery-based admissions
Enrollment	~300 students (80 per grade, 9-12)
Demand	~200 applications for 80 freshman seats (2.5:1 ratio)
Facility	Houses the Greater Chattanooga Digital Incubator (GCDI) Fab Lab, one of only two MIT FAB Foundation Leadership Schools in Digital Fabrication nationwide
Philosophy	Three core tenets, Collaboration, Critical Thinking, and Innovation, organize all learning through a deliberate four-year progression from foundational skills to professional autonomy

Who They Serve

STEM School Chattanooga serves a diverse student body: 55.6% White, 17.2% Black, 12.5% Multiracial, 11.1% Hispanic, 3.6% Asian. Admission is by lottery with no GPA or academic prerequisites. The school is located in a region that has transformed from what Walter Cronkite once called "the dirtiest city in America" into a technology hub with the nation's first gigabit internet service.

95-97%	graduation rate
Highest-Rated	STEM school in Tennessee
15+	major projects completed per graduate
$5.5M	in total college tuition savings for one graduating class
40-50+	public presentations per student across four years
Industry Certifications	SolidWorks, Fusion 360, pre-engineering credentials
Dual Enrollment	Students accumulate 5-19+ college credit hours through on-campus Chattanooga State partnership

What Makes It Distinctive

- **Radical simplification:** all learning organized around just three tenets (Collaboration, Critical Thinking, Innovation), each with a clear four-year developmental progression
- **Immediate immersion:** students deliver their first public presentation on Day 1 of freshman year
- **Professional partnerships:** Volkswagen, Tennessee Valley Authority, Siskin Hospital, EPB, and others provide authentic project contexts with real stakes
- **Model, Guide, Monitor, Release:** a quarterly teaching philosophy that moves students from dependence to autonomy sixteen times across four years
- **GCDI Fab Lab:** professional-grade fabrication tools (3D printers, laser cutters, CNC machines, electronics workstations) enabling students to build what they design

Opening: From Anxiety to Authority

Emma stood before STEM professionals presenting her team's educational app, her voice steady and confident. Four years earlier, this seemed impossible. "I couldn't present to save my life," she admits. "I was too fidgety, too nervous. I would stutter."

Then came Day 1 of ninth grade. "Literally, day one of freshman year, they made us create a presentation about selling shoes, and we had to go up there and present it." No warm-up. No preparation period. The content was deliberately low-stakes (everyone knows shoes), but the expectation was immediate and universal: public speaking happens here, it starts now, and everyone does it.

What followed was four years of relentless, progressive challenge. Sophomore year brought the Hunter Museum exhibition, where Emma presented fabricated artwork in a professional gallery setting to parents, museum visitors, and community members. Junior year escalated to business partner presentations with real clients and real consequences. Senior year, she co-led the Head of House student government, coordinating events that required mobilizing up to 40 peers.

The pinnacle: selected to speak at the county's State of Education event, addressing district leaders about her school. "I can speak really well in public. I very much realized that." That final phrase captures the identity transformation. Emma doesn't just perform competently. She has integrated communication skill into who she is.

Her journey captures what STEM School Chattanooga does systematically: it names exactly what it develops, creates authentic contexts for practicing it, scaffolds the challenge deliberately across four years, and surrounds students with relationships deep enough to sustain the struggle. Emma's transformation from paralyzed freshman to district spokesperson isn't exceptional luck. It's the predictable result of intentional design.

The Model: Three Tenets, Four Years, Deliberate Progression

STEM School Chattanooga was born from a blunt assessment. When Volkswagen announced plans for a manufacturing facility in Chattanooga, they expressed concern that local education wasn't preparing workers for the jobs they'd create. Community and business leaders responded by founding a school organized around what employers actually needed. Principal Jim David explains: "We went out to business partners and asked them, What are you missing? What do you see in the workforce?" The answer wasn't content knowledge. It was process skills.

From those conversations emerged three core tenets: Collaboration, Critical Thinking, and Innovation. The school made a deliberate choice: radical simplification. Rather than tracking dozens of competencies, they organized everything around three. David explains the reasoning: "Those are our big three. There's a resilience factor in there. There's a student self-sufficiency in there. But the big piece that we teach, the big pieces that we have broken down over the last several years is, what is collaboration, innovation and critical thinking, to the point where we have then defined those at every single grade level."

The simplicity is the point. With three tenets, everyone shares the same language: students, teachers, families, community partners. There's no ambiguity about what the school values or what students work toward.

The Four-Year Progression
What makes the framework powerful is its developmental scaffolding. Each tenet has grade-specific expectations that build systematically:

Freshman year establishes foundations. Collaboration means working with others different from you. Critical Thinking means taking personal ownership of learning. Innovation means being

original. These starting points assume nothing beyond willingness to engage.

Sophomore year introduces accountability and reflection. Students must now hold peers to standards, evaluate their own work critically, and embrace "Failure Redefined," the school's term for normalizing struggle before projects become high-stakes.

Junior year demands professional sophistication. Collaboration means managing complex timelines with real partners. Critical Thinking means prototyping and iterating through multiple solutions. Innovation means creating work others actually want.

Senior year requires full autonomy. Students network independently with experts, apply professional knowledge to novel problems, and invent solutions to challenges they've identified themselves.

Model, Guide, Monitor, Release
The tenets would remain abstract without a deliberate teaching philosophy. The school uses a quarterly cycle: first quarter, the teacher leads. Second quarter, the teacher works alongside the group. Third quarter, the teacher coaches only the group leaders. Fourth quarter, the teacher steps back. This cycle repeats across four years with increasing project complexity, creating sixteen progressions from dependence to autonomy.

Seen Through a Durable Skills Lens
STEM School Chattanooga didn't build its framework by consulting durable skills research. They built it by asking employers what was missing. What they constructed in response aligns remarkably with what researchers have independently identified as most transferable.

Collaboration maps directly. Critical Thinking maps directly. Innovation captures elements of Creativity and Fortitude (the "Failure Redefined" component). And the school's deliberate four-year progression develops Growth Mindset, Metacognition, and Communication through the structure itself, even though those terms don't appear in the three tenets. The convergence isn't accidental. It's because authentically engaging with what graduates need tends to produce frameworks that converge with what the research identifies.

In Practice: Three Student Journeys

Sophia: From Quiet and Reserved to Inclusive Leader

Teacher Sheila observed Sophia as a freshman and sophomore: "Very quiet, very reserved. She wasn't necessarily the one that I could see going, 'Hey, team, let's band together and, like, lead something.'"

The school's systematic approach reshaped her. Freshman year, the Myers-Briggs personality assessment taught collaboration through cognitive diversity. "Our very first project, we work with all people that have the same personality traits. We all have the same strengths, but also the same weaknesses." Second quarter brought deliberately diverse teams, teaching Sophia to navigate different thinking styles.

Junior year brought the defining challenge. Sophia's team partnered with Siskin Hospital to design a wheelchair-accessible mascot costume, enabling a child using a wheelchair to serve as school mascot. The project required navigating multiple stakeholders: hospital staff, the child and family, school administrators, and the Walking and Rolling organization. When initial designs failed, teacher Mr. Carrasco pushed persistently. "For weeks, it had to be at least, like a month, he would just continue to come to sit at our table and, well, I think that this can be improved. You guys aren't finished. There's always room for more improvement."

Then came the hardest lesson. Sophia enrolled in Calculus II and calculus-based physics at Chattanooga State and hit a wall. “It was hard not being the best. It was hard just not even doing well.” For someone whose identity centered on academic excellence, this was an identity crisis. The school’s “Failure Redefined” culture gave her a framework: “If I ever needed failure to redefine it was right there. But I really am so thankful that I got the opportunity to learn how to ask for help now.”

By senior year, Sophia held multiple leadership positions and had developed a sophisticated philosophy: “A leader can just be a person walking around the halls, uplifting people to feel comfortable enough to do really awesome things. Maybe you don’t need to necessarily always have the title to be a leader.” And: “I’m probably going to be the person who talks the most. So I initially had to learn to step back and make sure people who might not feel comfortable to talk feels heard.” She now heads to UTC’s Honors College for mechanical engineering.

THROUGH A DURABLE SKILLS LENS:
COLLABORATION · FORTITUDE · METACOGNITION · LEADERSHIP

Sophia’s journey is the report’s signature example of Progressive Complexity. Each year brought appropriately scaled challenges: personality-matched teams, then diverse teams, then professional hospital partnerships, then full autonomy. Her willingness to ask for help in calculus, after years of academic excellence, demonstrates Fortitude at its most authentic. And her evolved understanding of inclusive leadership, stepping back so others can be heard, represents sophisticated Collaboration that goes far beyond “works well with others.”

Luna: From Uncertain Freshman to Aerospace Engineering

Luna arrived after a middle school experience defined by distance. “The assistant principal gave us a speech about how if he didn’t know our names, that means we weren’t in his office in trouble.” Anonymity was the goal. STEM School inverted this on day one: “Once I got to STEM school, I walked through the door, Mr. David greeted me with my name, and it was just like a huge shift.”

Junior year became a crucible. Luna’s team created an interactive light box for children with disabilities at Siskin Hospital, integrating woodworking, electronics, Arduino programming, and developmental psychology. “I had to code the LED lights so that on the press of the buttons, you could change the colors. That was probably the hardest task of the whole light box creation.” The project taught her about failure: “I was pretty proud of that one, not only because me and my group came together to make it, but because of the failure that I went through.”

Senior year brought her tornado-resistant housing capstone. The project required meeting with a TVA civil engineer, partnering with a real estate agent who provided an actual house for scale modeling, and presenting at the Inventanooga competition. Luna also created community around her own initiative: “I created a book club so each of the grades could commune with each other. In one of my most recent book clubs, I got someone from every grade to come. That was my biggest success, because that was the point of creating it.”

Luna will attend the University of Alabama in Huntsville for aerospace engineering. “STEM school helped me decide because of the hands-on learning. When I was college searching, I was trying to find a school that was like STEM school.”

THROUGH A DURABLE SKILLS LENS:
CRITICAL THINKING · CREATIVITY · CHARACTER · GROWTH MINDSET

Luna's book club is a quiet but powerful example of Agency. She saw a gap in school culture (insufficient cross-grade interaction), designed a solution, and built it herself. That initiative, identifying a problem and creating something new to address it, mirrors the Innovation tenet the school explicitly teaches. Her college search criterion, finding a school "like STEM school," is Informed Vision at work: she knows from experience what learning environment develops her best, and she's choosing accordingly.

Oliver: From Isolation to Advocacy

Oliver carries a philosophy that guided his high school journey: "If you're going to be part of a place when you leave it, you should probably make it better before." This emerged from his lived experience as one of three Latino students in a grade of 70.

The challenges were real and often invisible. "A lot of people in my community don't do STEM, so it's been an experience to navigate. I only have one teacher at the STEM school who I can find is Latino. It would have been a lot easier to have more people to look up to, but sometimes it feels lonely, and sometimes you have struggles that other people really wouldn't understand."

Rather than accepting isolation, Oliver transformed it into purpose. He joined the Diversity Committee as a freshman and created the Multicultural Club to highlight "different cultures at the STEM school, since they're small, but they're still unique, and they're still important." Meanwhile, his technical development flourished through the electric car team, which competed at the national championship at Talladega NASCAR Superspeedway. Oliver's insight connects both threads: "I don't only innovate in engineering, but in my school environment. The Diversity Committee and Multicultural Club are innovations, doing things differently in our school environment."

THROUGH A DURABLE SKILLS LENS:
CHARACTER · LEADERSHIP · CREATIVITY · FORTITUDE

Oliver's story demonstrates something the research identifies but that rarely gets spotlighted: the courage it takes to be a first-generation STEM student from an underrepresented community. His recognition that creating social structures requires the same design thinking as technical challenges is a sophisticated form of transfer. And his persistence through loneliness, building belonging for those who will follow, is Fortitude applied to a purpose larger than himself.

What Makes It Work: Where STEM School Chattanooga Excels

Every school in The Path Forward study embraces the three core principles and draws on the four amplifiers to varying degrees. STEM School Chattanooga demonstrates all of them. Three stand out as genuinely distinctive.

Clear Identification: Radical Simplification
Most schools that explicitly identify target skills create frameworks of 7, 10, or 20 competencies. STEM School chose three. The decision was deliberate, and the results validate it. With only three tenets, every stakeholder shares common language. Every rubric maps to the same framework. Every project, every quarter, every year connects to Collaboration, Critical Thinking, and Innovation. Students can articulate what they're developing and where they stand at any moment because the framework is simple enough to internalize completely.

Sophia captures the omnipresence: "These tenets are prominently displayed throughout the school and integrated into every assignment and project through detailed rubrics." The tenets aren't posters on walls. They're the organizing principle for every piece of work students do. By senior year, students don't reference the tenets because they're required to. They reference them because the framework has become how they think.

Progressive Complexity: The Scaffolded Four-Year Arc
STEM School's four-year progression is the most deliberately designed developmental arc in the study. The interaction between vertical skill progression (what students develop each year) and the quarterly Model-Guide-Monitor-Release cycle (how much support they receive) creates sixteen distinct progressions from dependence to autonomy across four years. A ninth grader practicing "Diversity" in collaboration moves through all four release phases with close support. By senior year, that same student tackles "Networking" through the same cycle but with three years of autonomy-building behind them.

Emma's communication arc illustrates the power: Day 1 shoe presentation (low-stakes, peer audience), sophomore Hunter Museum exhibition (community audience, professional setting), junior business partner presentations (professional audience, real stakes), senior district spokesperson at the State of Education event (policy audience, institutional representation). Each stage prepared for the next. Without freshman safety, sophomore diversity would have overwhelmed her. Without junior authentic experience, senior spokesperson would have felt impossible.

Mr. Carrasco's approach to Sophia's team at Siskin Hospital demonstrates the "Monitor" phase in action. He didn't direct their work. He persistently questioned it: "I think that this can be improved. You guys aren't finished." That month of questioning forced the team to analyze failures systematically, generate alternatives, and iterate. The discomfort was the point. Sophia later recognized its value: "Mr. Carrasco pushed us towards failure so we could continue to become stronger."

Structured Reflection: Weekly Prototype Reports and Student-Led Conferences
Every week, students submit prototype reports documenting project progress and explicitly reflecting on which of the three tenets they're developing and how. Initially, students experience this as extra work. Charlotte admits: "The prototype reports felt like extra work, just more stuff to do."

Then perspectives shift. Charlotte continues: "But then I looked back at them at the end of the year, and I could see my growth. I could see how my Collaboration improved from the first project to the last, how my Critical Thinking got more sophisticated. It wasn't busywork. It was proof of my learning." By senior year, students have completed over 100 prototype reports. Reflection has become habitual rather than assigned.

Three times per year, students lead conferences with their families, a fundamental reversal of the traditional parent-teacher conference. Teacher Sheila explains: "It's not us giving the conferences. It's the students telling their parents, what did they do? What went wrong? How are they going to fix it." The structure requires students to synthesize learning across all classes, identify patterns in their growth, and articulate both successes and struggles to non-expert audiences.

Beyond Skills: Agency, Identity, and Possibility

What STEM School Chattanooga ultimately produces extends beyond capabilities. It produces agency, professional identity, and informed vision.

Agency shows up in senior year's capstone structure. Emma articulates the challenge: "You have to find your people, create and get in touch with anyone you need to, because it's not provided for us, because everyone has a different problem." Students identify their own problems, recruit their own expert partners, manage their own timelines, and present their solutions at Inventanooga. The school doesn't rescue them. It has spent three years building the capabilities that make genuine self-direction possible.

Professional identity emerges through the authenticity of the work. Sophia didn't simulate engineering collaboration. She designed adaptive equipment for a child at Siskin Hospital. Zoe didn't practice leadership in a classroom exercise. She led seven organizations simultaneously while carrying a full college course load. When students operate as GCDI interns teaching peers and adults how to use professional fabrication equipment, they're not playing at expertise. They are the experts.

Informed vision appears in how students choose what's next. Luna chose aerospace engineering because hands-on learning at STEM School revealed what engages her. Sophia chose mechanical engineering knowing she'll struggle again in college, and knowing how to handle it. Oliver sees STEM pathways as accessible for his community because he's walked them himself. "There are pathways, and I think a lot of people in my community don't think there are those opportunities, but they definitely are."

Transferable Insights for School Leaders

Simplify the framework, deepen the practice. Three tenets with clear four-year progressions created more consistent development than complex frameworks that overwhelm teachers and students. The question isn't how many skills to track. It's whether everyone in your building can name the skills and describe what growth looks like.

Start on Day 1. STEM School's shoe presentation established from the first hour that communication is non-negotiable and universal. The content was low-stakes. The expectation was not. Identify which skills are truly non-negotiable, then create immediate experiences requiring them before students develop elaborate avoidance strategies.

Design the progression before the projects. The four-year arc, freshman foundations to sophomore accountability to junior professional stakes to senior full autonomy, came first. Projects were designed to serve the progression, not the other way around. Map the developmental trajectory you want, then build experiences that serve it at each stage.

Push through discomfort, don't rescue from it. Mr. Carrasco questioned Sophia's team for a month. That was uncomfortable. It was also where the deepest learning happened. Teachers who rescue students from productive struggle prevent the development they're trying to create.

A Note on the Model's Limits

STEM School Chattanooga's results are remarkable. They are also the product of specific conditions: a 300-student enrollment enabling the "little big family" culture, location on a community college campus enabling seamless dual enrollment, a professionally equipped Fab Lab most schools can't replicate, and fourteen years of continuous refinement since opening in 2012. Replicating STEM School wholesale is not the point. The point is that the underlying commitments, a simplified shared framework, deliberate developmental progression, immediate immersion, authentic professional partnerships, and weekly reflection practices, can be adapted across very different contexts. STEM School Chattanooga proves they work. The work for other school leaders is to find their own version of the question: What are the three things that matter most for your graduates, and what does the four-year path to developing them look like?

This profile is part of a series documenting schools whose approaches have produced remarkable outcomes for students, and whose work, examined closely, illuminates how the capabilities researchers call durable skills develop in practice. It draws on interviews with STEM School Chattanooga students, educators, and leadership conducted during the 2024-25 school year. All student names are pseudonyms.

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America Succeeds
1390 Lawrence Street, Suite 200
Denver, CO 80204

www.AmericaSucceeds.org
info@AmericaSucceeds.org