Tennessee STEM and STE(A)M School Designation Rubric

Approved: April 2017
Revised: August 2023

Tennessee STEM and STE(A)M School Designation Process

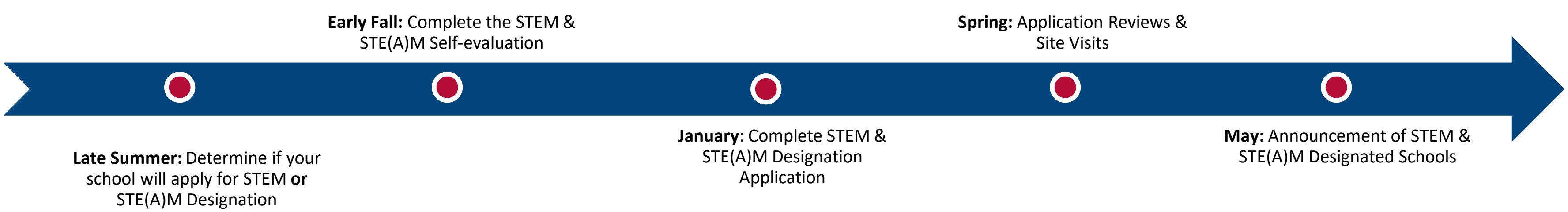
Mission	Vision
To promote rigorous STEM and STE(A)M-related learning opportunities for all students that lead to postsecondary achievement and high-quality careers.	To advance Tennessee as the leading state in STEM and STE(A)M education, developing a workforce able to compete and succeed in the current and emerging global economy.

Purpose:

STEM and STE(A)M education are unique approaches to teaching and learning that foster creativity and innovative thinking in all students. STEM and STE(A)M are focused on building critical and creative thinking and analysis skills by addressing how students view and experience the world around them. Strong STEM and STE(A)M teaching and learning opportunities rest on inquiry-, technology-, and project-based learning activities and lessons that are tied to the real world. STEM and STE(A)M education are diverse, interdisciplinary curriculum in which activities in one class complement those in other classes. In the STEM/STE(A)M classroom, robust partnerships reach beyond the walls of the school to include higher education and business partners in real-world lessons. STEM/STE(A)M education are two of the most effective tools we possess to prepare Tennessee students for tomorrow's workforce and success in college and career.

The Tennessee STEM and STE(A)M School Designation was developed to provide a "roadmap" for schools to successfully implement a STEM or STE(A)M education plan at the local level. The tools and resources created define the attributes necessary for a school to create a comprehensive STEM or STE(A)M learning environments for its students. A school that receives Tennessee STEM and STE(A)M School Designation will be recognized by the Tennessee Department of Education for its use of STEM or STE(A)M teaching and learning strategies and serve as a model from which other schools may visit and learn. Designated schools will also be invited to share promising practices at the annual Tennessee STEM Innovation Summit and become a member of Tennessee STEM Innovation Network's group of schools. All K–12 schools serving students in Tennessee are eligible.

Suggested Timeline



Review Process:

- **Select:** Your school should deliberately decide whether they are applying for STEM **or** STE(A)M Designation.

- **Intent to Apply:** Inform the Tennessee STEM Innovation Network (TSIN) of the school's intent to apply for designation status. A representative will contact the school's designated person to schedule an initial conversation.

- **Portfolio Review (The portfolio consists of the responses and artifacts compiled from the application.):** Members of Tennessee STEM/STE(A)M Designation Review Team* will review the portfolio created from the responses of the application for the attributes of the STEM and STE(A)M School Designation and associated artifacts to make a recommendation to begin the review for recognition at the state level. To ensure consistency, all members will score applications using the review criteria information presented in this application packet.
  Comprised of a group of experienced, diverse STEM and STE(A)M experts from across the state who are administrators, district leaders and teachers, the Tennessee STEM Innovation Network, and the Tennessee Department of Education.

- **School Site Visit**: School site visits will be conducted to follow up on specific elements and questions generated from the portfolio review. School site visits will only be conducted for schools that are being considered for STEM or STE(A)M School Designation based on their portfolio review outcomes. The school will be notified in advance to create a schedule for the visit.

- **Tennessee Department of Education Approval:** The Tennessee STEM/STE(A)M Designation Review Team will make a recommendation for STEM and STE(A)M School Designation awardees to the Tennessee Department of Education.

Designation Levels:

Each school will indicate a level of implementation for each of the proposed elements.

- **Early (1 point)** — **STEM/STE(A)M implementation has started**
- **Developing (2 points)** — **School has met some components, but still needs further development**
- **Accomplishing (3 points)** — **School meets many of the expectations**
- **Model (4 points)** — **Highest level of implementation of a STEM/STE(A)M school**

Elementary or Middle School		High School	
65-72 points	*'Model'*	*69-76 points*	*'Model'*
56-64 points	*'Accomplishing'*	*60-68 points*	*'Accomplishing'*
47-55 points	*'Developing'*	*53-59 points*	*'Developing'*
≤46 points	*'Early'*	*≤52 points*	*'Early'*

*The TDOE will only certify 'Model' Implementation STEM and STE(A)M Schools. 'Model' implemented STEM and STE(A)M Schools must demonstrate implementation of **90** percent of the STEM and STE(A)M attributes to obtain STEM or STE(A)M Designation. Schools will not receive designation if they receive a 1 or 2 in an attribute.*

Portfolio:

The applicant will complete the Tennessee STEM and STE(A)M online application, which requires a written response for each attribute within the rubric. The school may provide supportive evidence and artifacts in lieu of a written response to create a comprehensive portfolio.

Tennessee's STEM/STE(A)M Implementation Matrix

Model STEM/STE(A)M Implementation

A model STEM/STE(A)M Implementation describes an innovative model of education that provides real world learning experiences. Their transdisciplinary curriculum is integrated with authentic problem-based learning in order to promote the skills necessary to succeed in a global economy.

Accomplishing STEM/STE(A)M Implementation

An Accomplishing STEM/STE(A)M Implementation model describes an innovative school day where STEM/STE(A)M-related experiences are integrated into the curreculum.

Developing STEM/STE(A)M Implementation

A Developing STEM/STE(A)M Implementation model describes a traditional school day with limited STEM/STE(A)M-related experiences are offered during and after the school day.

Early STEM/STE(A)M Implementation

An Early STEM/STE(A)M Implementation model describes a traditional school day with limited after school STEM/STE(A)M-related experiences offered.

The rubric that follows provides an outline for the implementation of STEM attributes in schools. STEM attributes describe a quality STEM and STE(A)M education demonstrated within a school. For each attribute, there are criteria to describe an Early, Developing, Accomplishing, or Model school.

STEM and STE(A)M Schools Review Criteria: Each application will be evaluated using the following attributes of STEM and STE(A)M School Designation aligned to the four areas of focus in the Tennessee STEM Strategic Plan. Schools that seek to apply for STE(A)M School Designation will emphasize the arts integration within their narrative responses and artifacts provided within the portfolio application. STEM education intentionally connects learning experiences across each discipline—science, technology, engineering, and math. STEM occupations are projected to grow by 9% by 2029 and only 3% for non-STEM occupations[1]. Job applicants are considered more prepared and desirable when they have developed 21st Century Skills—the 4Cs known as creativity, collaboration, critical thinking, and communication. Research defines STE(A)M education as integrating the same interdisciplinary concepts as STEM but also incorporating the arts and humanities[2]. This educational approach allows students to develop and use skills of inquiry, which are unique to the arts and humanities.

What is the difference between applying for the STEM Designation versus the STE(A)M Designation?

STEM with the "A" includes

- Sharing knowledge with communication and English Language Arts
- A working knowledge of fine arts
- Better understanding past and present cultures and aesthetics through the fine arts
- Rhythmic and emotional use of math, physics, physiology and often language with the musical arts
- Understanding sociological developments, human nature, and ethics with the liberal arts

In alignment with the curriculum and instruction attributes on this rubric (pg.10-17), the best quality STE(A)M project/problem-based learning lessons intentionally connect two aligned standards from arts and core content areas. For example, if the science standard asks students to "demonstrate" something and the art standard asks students to "apply" their skills. Schools are encouraged to align instruction to these areas to support the processes and proficiencies of student learning to enhance the connection between the science, technology, engineering, art, and mathematics content.

Integrated STEM education is an effort to combine the four disciplines of science, technology, engineering, and mathematics into one class, unit, or lesson that is based on connections among these disciplines and real-world problems. More specifically, STEM integration refers to students participating in engineering design to develop relevant technologies/solutions that require meaningful learning through integration and application of mathematics and/or science[2]. STE(A)M education focuses on the same effort with the addition of intentional arts integration.

Resources:

- Standards for Mathematical Practices
- Science and Engineering Practices
- K-12 Computer Science Framework
- Fine Arts Standards
- K-5 STEM Standards Framework

[1]US Bureau of Labor Statistics (2021). Employment in STEM occupations, 2019 and projected 2029. Retrieved August 27, 2021, from https://www.bls.gov/emp/tables/stem-employment.htm.[2] Moore, T. J., & Smith, K. A. (2014). Advancing the State of the Art of STEM Integration. *Journal Of STEM Education: Innovations & Research, 15*(1), 5.

Infrastructure: A Tennessee Designated STEM and STE(A)M school requires a developed STEM Action Plan and a leadership team who collaborates frequently about the program's design and effectiveness. Teachers are highly collaborative and community members are included in decision making. Each of the following attributes promotes an infrastructure that is conducive to sustaining a well-rounded STEM/STE(A)M program.

Attribute 1.1 STEM Action and Sustainability Plan: Detailed strategic plan grounded in research and in which actions toward the Tennessee STEM and STE(A)M Attributes are outlined.

Attribute 1.2 Leadership Team: STEM/STE(A)M programming requires leadership teams who collaborate and engage in dialogue frequently about the STEM action plan's design and effectiveness. School leaders provide the opportunity for staff members to exhibit responsibility and commitment to the success of the school. The staff contributes to and has a say in decisions regarding the school. The staff collaborates for continued improvement.

Attribute 1.3 Leadership Professional Development: School leaders participate in professional development that addresses STEM/STE(A)M education issues to develop concepts of innovative leadership practices, enhance capacities to promote best practices across the curriculum, develop strategies to promote staff effectiveness and improve teaching and learning environments and to prepare leaders with the procedures and policies to promote success.

Attribute 1.4 School Environment: Facilities have been adapted or designed for STEM/STE(A)M learning. Spaces are available for collaboration and project work. Obvious efforts have been made to make resources available to students for use in learning, design, and project effort.

Attribute 1.5 School Schedules: School leaders create school schedules that allow consistent teacher collaboration; co-teaching and integration of subjects; and ample time for projects, teacher planning, and non-traditional courses.

Infrastructure: A Tennessee Designated STEM and STE(A)M school requires a developed STEM Action Plan and a leadership team who collaborates frequently about the program's design and effectiveness. Teachers are highly collaborative and community members are included in decision-making.

Attributes	Early	Developing	Accomplishing	Model
1.1 STEM Action and Sustainability Plan	Program leaders have created a **basic** STEM Action Plan in which actions toward STEM/STE(A)M attributes are outlined.	Program leaders have created a **detailed** STEM Action Plan grounded in research and defined the role the team plays in the STEM/STE(A)M planning and development prior to implementation.	Program leaders have **implemented** the STEM Action Plan and provided support to prepare teachers in the transformation of STEM/STE(A)M teaching methods.	Program leaders have **implemented** the STEM Action Plan, provided support to prepare teachers in the transformation of STEM/STE(A)M teaching methods, and have a developed presence of partnerships with postsecondary institutions and businesses to identify solutions for executing a quality STEM/STE(A)M program. The school plan includes plans for **sustainability and improvement** regardless of changes in leadership or staff with LEA support.
1.2 Leadership Team	The school has **no evidence** of this attribute in practice currently.	Program leaders have **included** this attribute in the school's STEM Action Plan document and are working to develop within the school.	The school leadership engages **selected** staff in action planning. The school leadership has an articulated process for staff to give input and feedback.	The school leadership engages **all** staff members in the development and decision making regarding the STEM Action Plan. The school leadership has an articulated process for staff members to give input and feedback and responds to feedback in an open setting.

1.3 Leadership Professional Development	The school leadership team **rarely** participates in professional development sessions that address STEM/STE(A)M education issues.	The school leadership team participates **semi-annually** in active, online professional development sessions that introduce novice STEM/STE(A)M education issues.	The school leadership team participates **annually** in a face-to-face **and semi-annually** in active, online professional development sessions that address current STEM/STE(A)M education issues.	The school leadership team participates **quarterly** in face-to-face, active, online professional development sessions, and networks with other STEM/STE(A)M school leaders to address current STEM/STE(A)M education issues.
1.4 School Environment	Classrooms are designed for collaborative work. Classroom locations facilitate the integration of STEM/STE(A)M content and teacher collaboration.	Classrooms are designed for collaborative work. Participating teachers foster a culture of inquiry with students through the implementation of [21st Century Learning Skills](http:/www.p21.org/) (http:/www.p21.org/) in every class.	Classrooms are designed for collaborative work. Virtual learning is used to connect students and teachers, to bring in outside STEM/STE(A)M expertise, or to exhibit student work. Classroom locations facilitate the integration of STEM/STE(A)M content and teacher collaboration. A culture of inquiry and creativity exists among teachers and students through implementation of 21st Century Learning Skills in every class.	Classrooms are designed for collaborative work. Additional spaces are identified for students to use for collaboration or work areas. Virtual learning is used to connect students and teachers, to bring in outside STEM/STE(A)M expertise, or to exhibit student work. Classroom locations facilitate the integration of STEM/STE(A)M content and teacher collaboration. A culture of inquiry and creativity exists among all students, teachers, and administrators through implementation of 21st Century Learning Skills in every class.

1.5 School Schedules	Participating teachers have a common planning time within the school day.	Participating teachers have a common planning time within the school day. Scheduling supports STEM/STE(A)M integration across two or more subjects, but not on a consistent basis.	Participating teachers have a common planning time within the school day. Scheduling supports STEM/STE(A)M integration across two or more subjects, i.e., block schedule, co-teaching, etc.	Schedules allow for consistent teacher collaboration, co-teaching and integration of subjects. Schedules allow ample time for projects, teacher planning, and non-traditional courses.
Infrastructure STE(A)M Attributes Characteristics	STE(A)M Designated Schools demonstrate through artifacts/evidence that they thoroughly integrate the arts into: a) the school's STEM Action Plan, b) STE(A)M Leadership Team by incorporating arts instructors and STE(A)M professionals as team members, c) professional development which improves the STE(A)M-focused content knowledge, and d) multidisciplinary PBL design. Professional Development can come from the state, district, STE(A)M professionals, higher education faculty, job-embedded, model STE(A)M schools, research based, and/or peer-to-peer methods.			

Artifact Examples:

1.1	• A fully formed STEM/STE(A)M Leadership Team has led stakeholders in a collaborative design process to create a detailed STEM Action Plan grounded in research and in which actions toward the Tennessee STEM and STE(A)M attributes are outlined. • The school provides evidence that a STEM/STE(A)M culture has been established. For example: a consistent problem-solving method (engineering design process/scientific method) approach is used throughout the school. • Program leaders' quarterly communication of the STEM Action Plan secures participation and buy-in from school faculty and key stakeholders.
1.2	• A fully formed STEM/STE(A)M Leadership Team has led stakeholders in a collaborative design process to create a detailed STEM Action Plan grounded in research and in which actions toward the Tennessee STEM and STE(A)M attributes are outlined.

1.3	• Evidence of Professional Development is provided and improves STEM/STE(A)M-focused content knowledge (advanced academics, agriculture, architecture, art, biotechnology, computer programming, cybersecurity, digital arts, energy, engineering, food science and nutrition, forensic science, healthcare science, graphic design, communications, finance, and/or information technology). • Sources of PD: state, district, STEM/STE(A)M professionals, higher education faculty, job-embedded, model STEM/STE(A)M schools, researched based, and peer-to-peer.
1.4	• Classrooms are designed for collaboration. (e.g., tables, moveable desks) • Spaces are available for collaboration and project work. (e.g., white boards, posters, art tools, project materials) Facilities reflect a focus on STEM/STE(A)M learning efforts. (e.g., technology, journals, science posters) • Obvious efforts are evident to make resources available to students for use in learning, design, and project efforts. (e.g., artifacts of PBL) Students use the information they have learned and demonstrate their mastery of content in the projects they work on. • There is a focus on creativity, critical thinking, communication, and collaboration in all subject areas.
1.5	• Provide evidence that teachers have a set time they collaborate (quarterly, monthly, weekly, etc.) together to plan integrated lessons, share/co-create STEM/STE(A)M activities and plan learning outcomes.

Curriculum and Instruction: The STEM/STE(A)M curriculum framework contains Tennessee State Standards and has articulated interconnectedness between science, technology, engineering, art, and mathematics and other content areas. Project-based and problem-based learning activities form a substantial part of the curriculum. Each of these following attributes strengthens a curriculum framework that is conducive to sustaining a well-rounded STEM/STE(A)M program.

Attribute 2.1 Project-based and Problem-based Learning: Quality STEM/STE(A)M learning experiences are student-led, engaged in real-world content and multiple solutions for promoting student collaboration and carefully designed to help students integrate knowledge and skills from science, technology, engineering, art, and mathematics. Learning experiences at a STEM or STE(A)M Designated School requires a thorough process of inquiry, knowledge building, and solution development. Curriculum includes projects and problem-solving tasks, often interdisciplinary and ranging from short- to long-term, which are focused on solving an authentic problem.

Attribute 2.2 Engineering Design Process & the Design Thinking Process: Quality STEM/STE(A)M learning experiences require students to demonstrate knowledge and skills fundamental to the engineering design process and design thinking (e.g., brainstorming, researching, designing, creating, testing, modifying).

Attribute 2.3 (A) Quality of Technology Integration: Technology is seamlessly embedded within the lesson and activities of all content areas and is not demonstrated as a separate entity, providing a student-centered environment that encourages personalized and blended learning. 1:1 devices or technology opportunities are used in an investigative manner with student created digital designs are evident.

Attribute 2.3 (B) Quality of Computer Science and Computational Thinking: Students move from being passive users of technology to engaged and innovative computer science thinkers by integrating Computer Science and Computational Thinking concepts seamlessly into instruction, providing opportunities through programming and/or computing devices that enhance the student experience. ***

Attribute 2.4 Exploring STEM/STE(A)M Careers: Quality STEM/STE(A)M learning experiences help students better understand and personally consider STEM/STE(A)M careers.

Attribute 2.5 College and Career Readiness Skills: Students use employability skills of communication, creativity, collaboration, leadership, critical thinking, and technological proficiency to create and consume in authentic ways.

Attribute 2.6 Integrity of the Academic Content (including Cognitively Demanding Work): Quality STEM/STE(A)M learning experiences are content accurate, anchored to the relevant content standards, and focused on the big ideas and foundational skills critical to future learning in the targeted discipline(s). A Designated STEM or STE(A)M School establishes curriculum expectations, monitoring, and accountability mechanisms that are reflectively revised to ensure fidelity of mission purpose (aligned resource allocation, integrated STEM/STE(A)M curriculum development, teacher professional growth, and student results). Students use thinking and processing skills. This includes considering alternative arguments or explanations, making predictions, interpreting their experiences, analyzing data, explaining their reasoning, and expressing and supporting their conclusions with evidence. Providing cognitively demanding work will promote student achievement in the areas of math and science.

Attribute 2.7 Enrichment Learning Activities: Students are given the opportunity to participate in STEM or STE(A)M enrichment activities that take place before, after, or during school hours. (e.g. competitions, STEM or STE(A)M exhibits, robotics, Science Olympiads, DECA, TSA, HOSA, NAHS, FCCLA, Future Educators Association, FFA, Business Professionals of America, FCCLA, clubs, makerspaces, etc.)

*** **Note Regarding - Attribute 2.3 (B) Quality of Computer Science and Computational Thinking:** This computer science attribute is not required for the 2023-24 application window. However, schools will have access and can submit a narrative and artifacts if schools would like feedback from the Review Team. However, this computer science attribute will **not** be included in this year's application scores.

Curriculum and Instruction: The STEM/STE(A)M curriculum framework contains the Tennessee State Standards and has articulated interconnectedness between science, technology, engineering, art, mathematics, and other content areas. Project and problem-based learning activities form a substantial part of the curriculum.

Attributes	Early	Developing	Accomplishing	Model
2.1 Frequency of PBL with Integrated Content Across Subjects	Units of PBL/Inquiry/ STEM or STE(A)M instruction is aligned to current Tennessee state standards and include integrated STEM/STE(A)M within science and mathematics and other content areas **once** a year.	Units of PBL/Inquiry/STEM or STE(A)M instruction is aligned to current TN State Standards and include integrated STEM/STE(A)M within science and mathematics and other content areas at least **twice** a year.	Units of PBL/Inquiry/STEM or STE(A)M instruction is aligned to current Tennessee state standards and include integrated STEM or STE(A)M within science and mathematics and other content areas at least **three quarters** of the year.	Units of PBL/Inquiry/ STEM or STE(A)M instruction is aligned to current Tennessee state standards and include integrated STEM or STE(A)M within science and mathematics and other content areas **throughout** the academic year.
2.2 Engineering Design Process and Design Thinking Process	The learning experience includes no requirement that students develop thinking skills required in the engineering design process.	The learning experience helps students develop or refine thinking skills that are part of the engineering design process without explicitly referencing the engineering design process.	The learning experience explicitly references the engineering design process and requires students to demonstrate thinking skills across multiple steps in the engineering design process.	The learning experience, in addition to explicitly referencing engineering design, requires students to demonstrate thinking skills in employing all steps in the engineering design process, including opportunities to experience the recursive nature of the process.

2.3 (A) Quality of Technology Integration	Students have limited opportunities to use technology (e.g., drill and practice). Schools incorporate 1:1 technology or provide students with the integration of technology opportunities, but limited evidence exists of students utilizing technology in an investigative process.	Computer-based/virtual technology tools are integrated into lessons. Students use **some** technology in the investigative process including virtual, computer-based, mobile, and data-collection devices. Schools incorporate 1:1 technology or provide students with integration of technology opportunities, **some** evidence exists of students utilizing technology in an investigative process.	Computer-based/virtual technology tools are integrated into lessons. Schools incorporate 1:1 technology or provide opportunities for investigative processes using **varied** technology. Students embed virtual, computer-based, mobile, and data collection devices, web-based lessons, computer applications, researching, digitally created designs, and/or reporting.	Teachers embed **varied** technology in the instructional process, including using technology as a facilitation of student learning in a transformative instructional manner. Students use **varied** technology in the investigative process including, but not limited to virtual, computer-based, mobile, and data collection devices, web-based lessons, computer applications, researching, reporting, communicating, and collaborating in ways not possible without the technology.
2.3 (B) Quality of Computer Science and Computational Thinking	**Little** evidence exists that students engage with computational thinking or computer science concepts.	Computational thinking and computer science concepts are **implied** during instruction, but there is no evidence students engage with those concepts.	Some students **engage** with computational thinking and computer science concepts, but engagement is **limited** across all students. Teachers intentionally integrate computer science or computational thinking in a content area, there is	All students **apply** computational thinking and computer science concepts in their reading, writing, speaking, or other communication skills. It is **evident** that computer science is part of student learning.

2.3 (B) Quality of Computer Science and Computational Thinking			**some** evidence through teacher lesson plans. Students create work products through the integration of coding, mobile app development, software development, web designs, networking, and/or cyber security in conjunction with the lesson.	Teachers **intentionally** integrate computer science or computational thinking, and students **connect** these to a content area both inside and outside of computer science through student work products. Students create work products through the integration of coding, mobile app development, software development, web designs, networking, and/or cyber security in conjunction with the lesson. Students **analyze work products** utilizing the engineering design process, collaborating, and communicating solutions and/or findings with other students and/or industry stakeholders.

2.4 Exploring STEM or STE(A)M Careers	**Once** a year, students participate in career exploration activities, which include opportunities to explore STEM/STE(A)M careers, professional activities, and employability skills (e.g., online activities, guidance from teachers, guidance from business partners, career fair, etc.).	**Twice** a year, students participate in career exploration activities, which include opportunities to explore STEM/STE(A)M careers, professional activities, and skills (e.g., online activities, guidance from teachers, guidance from business partners, career fair, etc.).	**Quarterly**, students participate in career exploration activities, which include opportunities to explore STEM/STE(A)M careers, professional activities, and skills (e.g., online activities, guidance from teachers, guidance from business partners, career fair, etc.).	**Monthly**, students explore careers, including STEM/STE(A)M careers, professional activities, and skills, as a part of their coursework (e.g., online activities, guidance from teachers, guidance from business partners, career fair, etc.).
2.5 College and Career Readiness Skills	The school **does not include** and/or does not have evidence of this attribute in practice, at this time.	Work is **in progress** to develop this attribute within the school. This element is included in the school's STEM/STE(A)M Action Plan.	Lessons/activities require students to exercise employability skills (Tennessee Department of Education Employability Skills Checklist). Lessons/activities require students to ask questions, define problems, and analyze and interpret data. Lessons/activities encourage students to effectively communicate and collaborate with their peers.	Lessons/activities require students to implement the employability skills (Tennessee Department of Education Employability Skills Checklist). Lessons/activities require students to ask questions, define problems, analyze and interpret data. Lessons/activities require students to effectively communicate and collaborate with their peers.

			Lessons/activities require students to collect evidence, revise their thinking, and interpret data within the text in order to effectively present information.	Lessons/activities require students to collect evidence, revise their thinking, and interpret data within the text in order to effectively present information. Lessons/activities require students to exercise time management to organize and complete their work.
2.6 Integrity of the Academic Content (Including Cognitively Challenging Work)	The academic content for the learning experience is **inaccurate** or is **not anchored** to the relevant academic content standards.	The academic content for the learning experience is accurately presented and appropriately anchored to at least **one** academic content standard for each content area represented.	The academic content for the learning experience is accurately portrayed and appropriately anchored to **more than one** academic content standard for each content area represented.	The academic content for the learning experience is accurately portrayed, tied to **multiple** content standards, and focused on helping students acquire deep understanding of a “big idea” or “foundational skill” critical to their future learning in the targeted discipline(s).

2.7 Extended Learning STEM/STE(A)M Activities	The school **does not include** and/or has **no evidence** of this attribute in practice at this time.	Work is **in progress** to develop this attribute within the school. This element is included in the school's STEM Action Plan.	The school offers extracurricular activities that are engaged in by **some** of the students. **Some** of the students participate in STEM/STE(A)M competitions onsite/online STEM/STE(A)M exhibits, and/or in state and national STEM/STE(A)M forums.	The school offers extracurricular activities that are engaged in by **most** of the students. **Most** of the students participate in STEM/STE(A)M competitions on-site/online STEM/STE(A)M exhibits, and/or in state and national STEM/STE(A)M forums.

Curriculum and Instruction STE(A)M Attribute Characteristics	STE(A)M Designated Schools demonstrate through artifacts/evidence that they thoroughly integrate the arts into; a) short- and long-term projects, b) the Engineering Design Process/Design Thinking process, c) the media students consume and create, d) career exploration activities, real or simulated, e) visual presentation skills and soft skills, f) student-centered problem solving, and g) extra-curricular opportunities.

Artifact Examples:

2.1	Short- and long-term projects/problems are implemented throughout the school year incorporating student-generated ideas that are standards-based, multidisciplinary and relevant to the real world. • Students can articulate the relationship among the concepts they learned in the content disciplines in their created projects. • The curriculum offers opportunities for student presentations of investigations and findings. • There is evidence that students engage in regular "arguments from evidence" during classroom instruction. • There are opportunities for students to interact with STEM/STE(A)M professionals to support curriculum. • There are opportunities that involve older students working with elementary/middle school students in the STEM/STE(A)M program. • A specialized science, math, art, and/or engineering program(s) is being used for deeper learning.
2.2	The Engineering Design Process/Design Thinking is referenced in all classes as a possible strategy to addressing a problem. • An entrepreneur component of the STEM/STE(A)M program may be in place. • Collaborative projects that require planning, research, discussion/debate, and presentations. • Products that require students to analyze and interpret data, construct explanations and design solutions, and engage in argument from evidence. • Experimentation that requires students to illustrate their understanding of STEM/STE(A)M concepts. • Peer/Self-assessment on products using rubrics. • Solving problems using real-world applications. • Student demonstrations that reflect mastery of STEM/STE(A)M content and procedures. • Portfolios that allow students to portray their learning via collections of personal work.
2.3 (A)	Students are regular producers of websites, blogs, computer programs, videos, classroom digital products, artistic expression, etc. ● Evidence of computer-based, online, mobile, virtual, and other technology tools are integrated into STEM/STE(A)M classwork. ● Evidence of technology tools are used to collect and analyze data. ● Evidence that students are using laptops/tablets in an investigative manner beyond the research needed to solve a problem. ● STEM/STE(A)M industry-related technology is available for student use. (i.e., 3D printers, robotic systems, simulators, programmable project controllers, etc.) ● 21st-century technology tool products by students are visible throughout the school. ● Teachers and students receive ongoing access and opportunity to expand their proficiency in technology use. Evidence for 2.3(A) and 2.3(B) could be showcased simultaneously to support both the quality of technology integration and computer science.

2.3 (B) ***	Students move from being passive users of technology to engaged and innovative computer science thinkers. - Computational thinking is a problem-solving skill that involves breaking down complex problems into smaller, manageable pieces, recognizing patterns, designation algorithms, and using computers and other tools to help solve computer science concepts related to standards. - Evidence that students engage in computational thinking through both plugged and unplugged activities. - Evidence of how students provide critical feedback for how to improve or change a computational model or programming application. - Evidence for how programming and physical computing devices enhance student learning of a concept. - Lesson plans indicate the integration of computational thinking and/or computer science by including CS/CT concepts, vocabulary, connections to standards, and clear targets. - Evidence for 2.3(A) and 2.3(B) could be showcased simultaneously to support both the quality of technology integration and computer science. For tips on best practices, visit the guidebook: https://www.computersciencetn.org/wp-content/uploads/CS-Integration-Guidebook-.pdf *** **Note Regarding - Attribute 2.3 (B) Quality of Computer Science and Computational Thinking:** This computer science attribute is not required for the 2023-24 application window. Schools will have access and can submit a narrative and artifacts if schools would like feedback from the Review Team. However, this computer science attribute will **not** be included in this year's application scores.
2.4	The learning experience requires students to complete tasks in a simulated or real STEM/STE(A)M work environment in which they are working like STEM/ STE(A)M professionals. In addition, the experience includes an activity intentionally designed to help students explore the relevant STEM/STE(A)M careers and their educational requirements. - A culminating project that integrates all the STEM/STE(A)M content areas (capstone). - Student work created in collaboration with a business/community/postsecondary partnership. - Speaker series, job shadowing, touring STEM/STE(A)M business/industries, mentorships with students for projects/investigations. - STEM or STE(A)M career days/nights. - Collaboration with teachers to design real world projects/problems. - Partnership involvement in executing the STEM/STE(A)M program, partnerships are purposeful, and mutually beneficial. - Museum or university partnerships, which may include virtual collaboration with partners. - Survey shows changes in student mindsets around STEM/STE(A)M careers. - Usage of STEM or STE(A)M career awareness modules. (i.e., Defined Learning, Defined Careers, Elevate TN, etc.)

<table>
<tr><td>2.5</td><td colspan="2">The curriculum offers opportunities for student presentations of investigations and findings.
• There is evidence that students engage in regular literacy tasks, “arguments from evidence,” during classroom instruction:
  ○ Lessons/activities require students to regularly exercise skills they will use in the workplace.
  ○ Lessons/activities require students to demonstrate leadership and responsibility.
  ○ Lessons/activities require students to present information effectively and are aligned with the Tennessee learning standards.
  ○ Lessons/activities require students to exercise time management and organize their work.</td></tr>
<tr><td>2.6</td><td colspan="2">Classroom instruction is predominantly student-centered, and students are asked to think in complex ways and apply the knowledge and skills they have acquired.
• Students are asked to create solutions and take action that further develops their skills and knowledge.
• Students are asked to support their conclusions with evidence and explain their reasoning.
• Students are asked to come up with alternative explanations or arguments and to make hypotheses or predictions.</td></tr>
<tr><td>2.7</td><td>Any extended learning experience including, but not limited to:
• Science Olympiad Team
• Lego Robotics
• Vex Robotics
• DECA
• TSA
• HOSA
• Future Educators Association
• Elevate TN</td><td>• Business Professionals of America
• FCCLA
• FFA
• School-wide or district science and engineering fair
• Destination Imagination
• Math Challenge Contests
• Technology Student Association
• eCybermission
• Defined Learning/Defined Careers</td></tr>
</table>

****** **Note Regarding - Attribute 2.3 (B) Quality of Computer Science and Computational Thinking:** This computer science attribute is not required for the 2023-24 application window. Schools will have access and can submit a narrative and artifacts if schools would like feedback from the Review Team. However, this computer science attribute will **not** be included in this year's application scores.

Professional Development: **A Tennessee Designated STEM or STE(A)M School ensures a systemic professional development model that provides continuous learning based on student results, teacher development, and the short- and long-term goals of the school. The PD model, including school-level and personalized plans, creates an environment that allows educators to continue to learn and pursue opportunities that build the capacity to provide better STEM learning opportunities for students. Each of the following attributes creates an environment of continued learning for all that is conducive to sustaining a well-rounded STEM/STE(A)M program.**

Attribute 3.1 Quality STEM/STE(A)M Professional Learning: Quality STEM/STE(A)M professional learning aligns with STEM and STE(A)M initiatives and is provided throughout the year to support the school's STEM Action Plan.

Attribute 3.2 Designing PBLs: Teachers participate in professional development that addresses integrated content, community/industry partnerships, and connections with postsecondary education, pedagogy, art and design opportunities, and digital learning to develop PBLs that are custom designed to provide relevant learning for the school's student population by providing opportunities to research challenges within the community.

Professional Development: A Tennessee Designated STEM or STE(A)M School ensures a systemic professional development model that provides continuous learning based on student results, teacher development, and the short- and long-term goals of the school. The PD model, including school-level and personalized plans, creates an environment that allows educators to continue to learn and pursue opportunities that build the capacity to provide better STEM/STE(A)M learning opportunities for students.

Attributes	Early	Developing	Accomplishing	Model
3.1 Quality STEM/ STE(A)M Professional Learning	Teachers participate in large group professional development sessions that introduce STEM/STE(A)M teaching skills.	Teachers participate in large group professional development sessions focusing on critical STEM/ STE(A)M teaching skills.	Teachers have identified unique professional development goals and participate in large and small group and personalized learning professional development sessions. PD includes support across the school year during implementation of school-based STEM/ STE(A)M strategies. Teachers observe colleagues and engage in formal reflection and discourse regarding practice. PD sessions align with the needs of the program/school and student learning needs.	Professional development is ongoing and aligns with STEM/STE(A)M initiatives and includes support across the school year. Teachers have an articulated process for identifying unique professional development goals and opportunities. They participate in large and small group and personalized learning professional development sessions (e.g., strategies for inquiry- based instruction, for integrating STEM/STE(A)M. Teachers observe colleagues and engage in formal reflection and discourse regarding practice. PD is often embedded in the working day and aligns with the needs of the program/school and student learning needs.

				Teachers participate in externships and mentorships with higher education and/or industry partners to ensure progressive expectations for educators' application of content knowledge, curriculum design, and delivery.
3.2 Designing PBLs	Teachers participate in PD sessions that provide information and samples of project/problem-based learning STEM/ STE(A)M modules.	Teachers participate in PD sessions that provide samples and information on the development of project/problem-based learning STEM/STE(A)M modules.	Teachers collaborate to custom design project/ problem-based learning STEM/STE(A)M modules.	Teachers collaborate to custom design project/problem-based learning STEM/STE(A)M modules. Higher education and/or industry partners contribute to design of the school's custom built PBLs. The STEM/STE(A)M modules include the department's learning standards and integrate content areas and 21st Century Learning Skills.
Professional Development STE(A)M Attribute Characteristics	STE(A)M Designated Schools demonstrate through artifacts/evidence that they thoroughly integrate the arts into; a) professional learning opportunities including but not limited to collaborative PBL planning practices, integrated instruction, and content knowledge, and b) project/problem/place-based learning opportunities. Culminating work includes aspects of the arts in research, content knowledge, and/or presentation.			

Artifact Examples:

3.1	Documentation of STEM/STE(A)M-specific professional learning for all STEM/STE(A)M teachers that incorporates the following: • Project/problem/place-based learning. • Integrated instruction. • Investigative research-based practices. • Collaborative planning practices. • Improve the STEM/STE(A)M-focused content knowledge (advanced academics, agriculture, architecture, art, biotechnology, computer programming, cybersecurity, digital art, energy, engineering, food science and nutrition, forensic science, healthcare science, and/or information technology). STEM/STE(A)M teachers document integration of the following into their instructional practices: • Attend content area national/regional conference. • Have tailored professional learning to their specific needs. • Participate in a job-embedded or practice-based approach to professional learning. • Attend content area state conference. • Participate in project/problem-based learning professional learning. • Participate in professional learning related to STEM/STE(A)M integration. • Participate in professional learning to strengthen STEM/STE(A)M content knowledge and skills. • Observe other STEM/STE(A)M teachers. (peer observations, instructional rounds, etc.)
3.2	PBL units should include the following: • Learning that is student-led, interdisciplinary, and engaged in real-world content and multiple solutions for student cooperation utilizing STEM/STE(A)M knowledge and skills. • Portfolios that allow students to portray their learning via collections of personal work. • Group projects that require planning, research, discussion/debate, and presentations. • Written products that require students to analyze and interpret data, construct explanations and design solutions, and engage in argument from evidence. • Experimentation that requires students to illustrate their understanding of STEM/STE(A)M concepts. • Authentic assessments on products using rubrics. • Student demonstrations that reflect mastery of STEM/STE(A)M content and procedures. • A culminating project that integrates all the STEM/STE(A)M content areas.

Achievement: Assessments are incorporated to measure student outcomes and teacher instruction to ensure a strong, innovative, and cohesive STEM/STE(A)M program. Each of the following attributes use innovative assessments to sustain a well-rounded STEM/STE(A)M program.

Attribute 4.1 Performance Assessments: A variety of assessments are incorporated to measure student outcomes and teacher instruction to ensure a strong, innovative, and cohesive STEM/STE(A)M program. The assessment plan includes rubric-based performance assessments that require students to demonstrate knowledge of STEM/STE(A)M concepts and skill in completing authentic tasks that model performances in work-based learning.

Attribute 4.2 Accountability (Data): Diagnostic, ongoing, and vertically and horizontally aligned formative and summative assessments are used for all students to drive instructional decisions to promote student achievement.

Achievement: Assessments are incorporated to measure student outcomes and teacher instruction to ensure a strong, innovative, and cohesive STEM /STE(A)M program.

Attributes	Early	Developing	Accomplishing	Model
4.1 Performance Assessments	Performance-based assessments are used to monitor student learning. State-wide data is used to drive instructional practices.	Performance-based and pre/post assessments are used to monitor student learning. Student observations are included as an assessment tool. State-wide data is used to drive instructional practices.	Teachers use performance-based assessments to determine student learning. Pre/post assessments are used to show student growth. Non-traditional assessments are used to monitor student processes. State-wide data is used to drive instructional decisions. Teachers use observation and monitor student dialogue to assess student processes in problem solving and innovation.	Teachers use performance-based assessments to determine student learning. Pre/post assessments are used to show student growth. Teachers use observation and monitor student dialogue to assess student processes in problem solving and innovation. Students participate in self-evaluation and goal setting consistently. The school uses data from state-wide and school assessments to drive instructional decisions.

4.2 Accountability (Data)	Teachers minimally use student data to guide instruction. Only state standardized tests are used. Data is only tracked for special populations.	Teachers and school staff use standardized test data to guide instruction. Teachers also collect formative data about students.	Teachers and school staff use state standardized test data, in addition to other standard assessments. Teachers collect formative data. All student data is tracked down to the individual student's needs, possibly through use of individual learning plans or specialized software. Data walls and a variety of other data tracking systems are employed.	Teachers and school staff use state standardized test data, in addition to other standardized state and national, district, and classroom assessments. Teachers collect formative data and maintain records for all students. All student data is tracked down to the individual students needs and each student has an individual education plan. Data walls and a variety of other data tracking systems are employed. Student data conferences are provided to help students understand their data.
Achievement STE(A)M Attribute Characteristics	STE(A)M Designated Schools demonstrate through artifacts/evidence that they thoroughly integrate the arts into: a) assessments, including but not limited to performance assessments, and b) assessments that inform instructional practices for all students.			

Artifact Examples:

4.1	A variety of assessments are incorporated to measure student outcomes and teacher instruction to ensure a strong, innovative, and cohesive STEM/STE(A)M program. Examples of Data/Performance Assessments include: • Portfolios that allow students to portray their learning via collections of personal work. • Group projects that require planning, research, discussion/debate, and presentations. • Written products that require students to analyze and interpret data, construct explanations and design solutions, and engage in argument from evidence. • Experimentation that requires students illustrate their understanding of STEM/STE(A)M concepts. • Authentic assessments on products using rubrics that focus on solving problems using real-world applications. • Student demonstrations that reflect mastery of STEM/STE(A)M content and procedures. • Culminating project that integrates all the STEM/STE(A)M content areas.
4.2	Evidence that diagnostic, ongoing, and vertically and horizontally aligned formative and summative assessments are used for all students to drive instructional decisions. • Built-in planning time for teachers to interpret student data and adjust their instruction accordingly. • Teachers provide evidence of an instructional change based on data. • There is evidence that students participate in self-evaluation and goal setting consistently

Community and Postsecondary Partnerships: Community and postsecondary STEM/STE(A)M partnerships are established and provide connections between curriculum taught in the classroom and practical applications outside of school. These partnerships have created an environment in which students develop high-level STEM/STE(A)M skills and knowledge inside and outside of the classroom and increase their readiness for college and careers. These attributes are essential in creating connections between what is taught and real-world settings to sustain a well-rounded STEM/STE(A)M program.

Attribute 5.1 Partners Support Instruction: Direct experiences with STEM/STE(A)M professionals, professional STEM/STE(A)M work environments, and/or practical applications of STEM/STE(A)M content, including experiences that incorporate innovative design and art immersion led by professionals within the arts community, during and/or outside school are available to students. Short-term (classroom speaker, donations, etc.) and long-term (multiple touch points throughout the year, quarterly interactions with teachers for PBL development, etc.) partnerships have been developed and utilized.

Attribute 5.2 Work-based Learning: STEM/STE(A)M work-based learning experiences increase interests and abilities in fields requiring STEM/STE(A)M skills for high school students. See the K–12 progression below:

<table>
<tr><th colspan="3">Career-exploration WBL Methods</th><th colspan="2">Pre-professional WBL Methods</th><th colspan="3">Career-preparation WBL Methods</th></tr>
<tr><th colspan="5">Exploration</th><th colspan="3">Immersion</th></tr>
<tr><td>Industry Awareness</td><td>Career Awareness</td><td>Service Learning</td><td>Career Exploration</td><td>Service Learning</td><td>Clinical Experience</td><td>Service Learning</td><td>Career Training</td></tr>
<tr><td colspan="3">Primarily grades K–5 but continuing into higher grades</td><td colspan="2">Primarily grades 6–8 but continuing into upper grades</td><td colspan="3">Primarily grades 9–12 but continuing into postsecondary</td></tr>
<tr><td colspan="3">• Foster career and workplace awareness
• Promote career exploration
• Strengthen motivation and informed decision-making skills</td><td colspan="2">• Deepen career and work readiness knowledge
• Develop personal qualities and workplace readiness skills
• Impart beginning professional skills</td><td colspan="3">• Develop technical knowledge and skills necessary for entry into a specific occupation
• Strengthen industry and career awareness, career exploration, preparation, and training</td></tr>
</table>

Attribute 5.3 College Opportunities: The high school provides courses (online courses included) for preparation in college courses and career training; these courses develop time management, prioritization, and organization skills.

Community and Postsecondary Partnerships: **Community and postsecondary STEM/STE(A)M partnerships are established and provide connections between curriculum taught in the classroom and practical applications outside of school. These partnerships have created an environment in which students develop high-level STEM/STE(A)M skills and knowledge inside and outside of the classroom and increase their readiness for college and careers. These attributes are essential in creating connections between what is taught and real-world settings to sustain a well-rounded STEM/STE(A)M program.**

Attributes	Early	Developing	Accomplishing	Model
5.1 Partners Support Instruction	Work is in **progress** to develop this attribute within the school. School has at **least 1** outside partnership established in either short or long-term nature that helps shape the school's culture.	Partners from industry, institutes of higher education, and technical centers are **utilized** to extend student learning via classroom speakers, judges, donations, etc. School has established at **least 1 long-term** partner outside of the school district that showcases multiple touch points throughout the school year.	Partners from industry, institutes of higher education, and technical centers **participate** in extended learning opportunities as a part of the school's work towards STEM/STE(A)M implementation. School has established at **least 1 long-term** partner outside of the school district that showcases multiple touch points throughout the school year.	Students have **more than 1 long-term** direct experience with STEM/ STE(A)M professionals in authentic environments. Field experiences involving industry partners are **embedded** within the design process and implementation of project-based learning (PBLs) to provide authentic, real-world STEM/STE(A)M content and industry skills to classroom instruction. Industry partners are **integrated** into the PBL design and decision-making process through the co-creation of lesson plans or essential questions to guide the student experience.

				School has **developed** partnerships that are both **short-term** (classroom speaker, donations, etc.) and **long-term** (multiple touch points throughout the year, quarterly interactions with teachers for PBL development, etc.) that help shape the
5.2 Work-Based Learning (WBL)	Students **rarely** have an active, work-based learning experience with an external STEM/STE(A)M industry partner, either during or outside of the school day.	Students have at **least 1 active**, work-based learning experience annually with an external STEM/STE(A)M industry partner, either during or outside of the school day. The WBL experience **promotes** industry and career awareness.	Students have **2 active**, work-based learning experiences annually with an external STEM/STE(A)M industry partner, either during or outside of the school day. The WBL experiences **promote** industry and career awareness and exploration.	Students **regularly** have active, work-based learning experience annually with an external STEM/STE(A)M industry partner, either during or outside of the school day. The WBL experiences **promote** industry and career awareness and exploration, and experience in career preparation and training. Students and/or teachers participate in **internships** or **apprenticeships** with an external industry partner before, during, or after school to further promote career awareness and postsecondary preparation.

<table>
<tr>
<td>5.3
Postsecondary Opportunities

HIGH SCHOOL ONLY</td>
<td>An early postsecondary opportunity (EPSO) plan is developed to encourage student success in high school to college transition.

Online courses are not available.

Workforce Ready classes are not available.</td>
<td>An early postsecondary opportunity (EPSO) plan introduces and offers at least 6 college credits.

A technology plan is established to provide online learning for students.

A Workforce Ready plan is established and working toward implementation.</td>
<td>An early postsecondary opportunity (EPSO) plan is established and offers at least 12 college credits.

High school courses are reinforced by technology-based teaching methodologies and opportunities to obtain certifications (e.g., flipped class model, blended learning, and MOOCs).

A Workforce Ready plan is implemented, and some students participate and earn credentials.</td>
<td>An early postsecondary opportunity (EPSO) plan is integrated and offers at least 15 college credits.

Partner with industry and higher education to collaborate with the high school staff to continually evaluate and improve course offerings.

High school courses are enhanced by technology-based teaching methodologies and opportunities to obtain industry certifications (e.g., flipped class model, blended learning, and MOOCs).

A Workforce Ready plan is implemented, and some students participate and earn industry credentials.</td>
</tr>
<tr>
<td>Community and Postsecondary STE(A)M Attribute Characteristics</td>
<td colspan="4">STE(A)M Designated Schools demonstrate through artifacts/evidence that they thoroughly integrate the arts in:
a) partnerships with business, industry, and other community partners that include STE(A)M careers where students have opportunities to interact with STE(A)M professionals that support the curriculum,
b) internships, mentorships, work-based learning, personalized plans, and/or industry visits for older students and workplace problem solving that includes the arts for younger students, and
c) early postsecondary opportunities.</td>
</tr>
</table>

Artifact Examples:

5.1	• Partnerships with business, industry, and other community partners have been formed and are involved by directly connecting to in-class instruction, project/problem-based learning, and exposing students to STEM/STE(A)M careers. • There are opportunities for students to interact with STEM/STE(A)M professionals to support curriculum.
5.2	Students have access to and participate in: • Internships, mentorships, work-based learning, personalized plans, industry visits. Evidence provided by agendas, sign-in sheets, and/or proof of work completed letters. • For lowers grades, PBL lessons/units aligned to STEM/STE(A)M essential questions that engage students in workplace problem solving.
5.3	• A plan has been developed to provide postsecondary-level courses/dual enrollment credit, International Baccalaureate, articulated credit, and/or Advanced Placement. • A plan has been created to provide innovative pathways with the high school and higher education partners for students to obtain high school and postsecondary credit through online resources, virtual courses, and/or distance learning courses to promote STEM/STE(A)M careers.

Resources Used in Development of the Tennessee STEM or STE(A)M School Designation

Georgia STEM AND STE(A)M Program:
http://www.bremencs.com/images/pdfs/STEMProgramCertificationRubricforElementarySchools.pdf

Indiana STEM AND STE(A)M School Program:
Indiana STEM AND STE(A)M School Application

North Carolina STEM AND STE(A)M School and Leadership Program:
http://www.dpi.state.nc.us/stem/schools/

Ohio STEM AND STE(A)M School Program:
http://education.ohio.gov/Topics/STEM-Science-Technology-Engineering-and-Mathem/STEM-and-STEAM-School-Designation

STEM AND STE(A)M Schools Study – Outlier Research and Evaluation with University of Chicago:
http://outlier.uchicago.edu/s3/