



# Tennessee STEM School Designation Rubric

Approved: April 2017  
Revised: June 2018

# Tennessee STEM School Designation Process

## Mission

To promote rigorous STEM-related learning opportunities for all students that lead to postsecondary achievement and high quality careers.

## Vision

To advance Tennessee as the leading state in STEM education, developing a workforce able to compete and succeed in the current and emerging global economy.

## Purpose:

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

*The Tennessee STEM School Designation was developed to provide a "roadmap" for schools to successfully implement a STEM education plan at the local level. The tools and resources created define the attributes necessary for a school to create a comprehensive STEM learning environment for its students. A school that receives Tennessee STEM School Designation will be recognized by the Tennessee Department of Education for its use of STEM 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:

- **Interview:** 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 that is found in this packet.):** Members of Tennessee STEM Designation Review Team\* will review the portfolio created from the responses of the application for the attributes of the STEM 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 members of the Tennessee STEM Leadership Council and the Tennessee STEM Innovation Network**
- **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 School Designation based on their portfolio review outcomes. The school will be notified four weeks in advance to create a schedule for the visit.
- **Tennessee Department of Education Approval:** The Tennessee STEM Designation Review Team will make a recommendation for STEM 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.

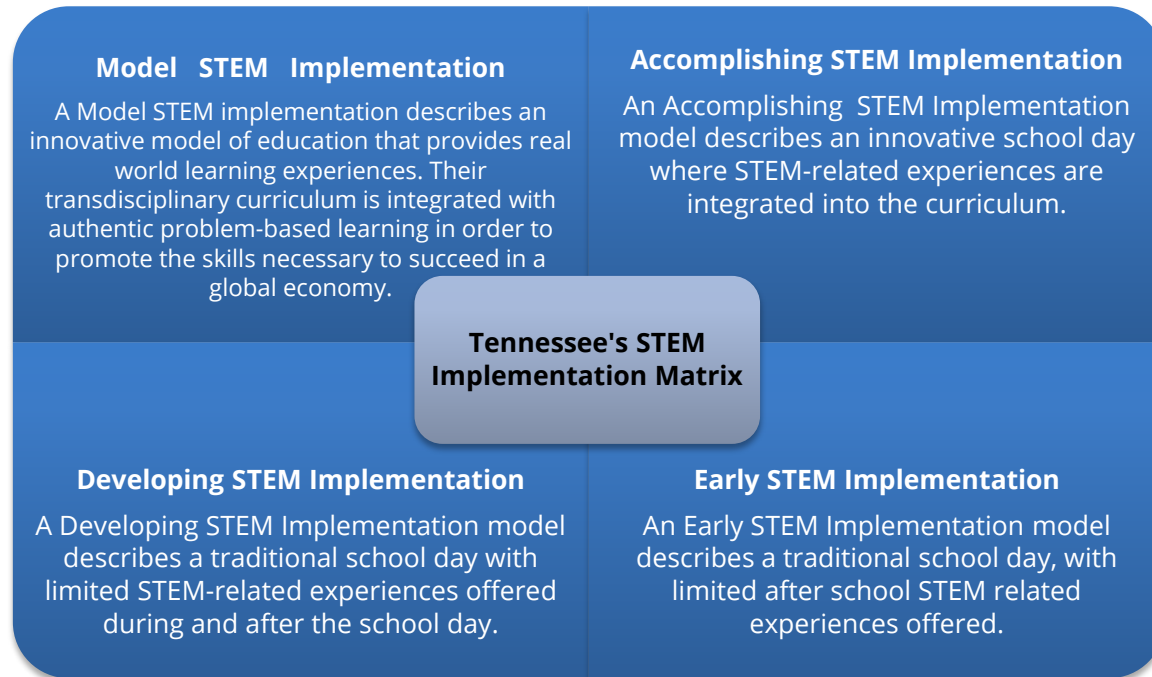
- **Early (1 point)**                      **STEM implementation has started**
- **Developing (2 points)**            **School has met some components, but still needs further development**
- **Accomplishing (3 points)**       **School meets many of the expectations**
- **Model (4 points)**                   **Highest level of implementation of a STEM 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 Schools. 'Model' implemented STEM Schools must demonstrate implementation of 90 percent of the STEM attributes in order to obtain STEM Designation. Schools will not receive designation if they receive a 1 or 2 in an attribute.*

## **Portfolio:**

The applicant will complete the Tennessee STEM Application Packet, which requires a written response for each STEM attribute. The school may provide supportive evidence and artifacts in lieu of a written response to create a comprehensive portfolio.



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

**STEM Schools Review Criteria:** Each application will be evaluated using the following attributes of STEM School Designation aligned to the four areas of focus in the Tennessee STEM Strategic Plan.

**Infrastructure:** A Tennessee Designated STEM school requires a developed STEM strategic 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 program.

**Attribute 1.1 STEM Action and Sustainability Plan:** Detailed STEM strategic plan grounded in research and in which actions toward the Tennessee STEM Attributes are outlined.

**Attribute 1.2 Leadership Team:** STEM 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 education issues in order 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 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 school requires a developed STEM strategic 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
<p><b>1.1 STEM Action and Sustainability Plan</b></p>	<p>Program leaders have created a basic STEM plan in which actions toward STEM attributes are outlined.</p>	<p>Program leaders have created a detailed STEM plan grounded in research and defined the role the team plays in the planning and development prior to implementation.</p>	<p>Program leaders have implemented the STEM plan and provided support to prepare teachers in the transformation of STEM teaching methods.</p>	<p>Program leaders have implemented the STEM plan, provided support to prepare teachers in the transformation of STEM teaching methods, and have developed partnerships with postsecondary institutions and businesses to identify solutions for executing a quality STEM program. The school plan includes plans for sustainability and improvement regardless of changes in leadership or staff with LEA support.</p>
<p><b>1.2 Leadership Team</b></p>	<p>The school does not have evidence of this attribute in practice at this time.</p>	<p>Program leaders have included this attribute in the school's STEM planning document and are working to develop within the school.</p>	<p>The school leadership engages selected staff in strategic planning. The school leadership has an articulated process for staff to give input and feedback.</p>	<p>The school leadership engages all staff members in strategic planning. The school leadership has an articulated process for staff members to give input and feedback and responds to feedback in an open setting. The faculty members make decisions regarding the STEM action plan.</p>

<p><b>1.3 Leadership Professional Development</b></p>	<p>The school leadership team rarely participates in professional development sessions that address STEM education issues.</p>	<p>The school leadership team participates semi-annually in active, online professional development sessions that introduce novice STEM education issues.</p>	<p>The school leadership team participates annually in a face-to-face and semi-annually in active, online professional development sessions that address current STEM education issues.</p>	<p>The school leadership team participates quarterly in face-to-face, active, online professional development sessions, and networks with other STEM school leaders to address current STEM education issues.</p>
<p><b>1.4 School Environment</b></p>	<p>Classrooms are designed or oriented for collaborative work.</p> <p>Classroom locations facilitate the integration of STEM content and teacher collaboration. (i.e. math classrooms may be located next to the science classroom)</p>	<p>Classrooms are designed for collaborative work.</p> <p>Participating teachers foster a culture of inquiry with students through the implementation of 21st Century skills (<a href="http://www.p21.org/">http://www.p21.org/</a>) in every class.</p>	<p>Classrooms are designed for collaborative work.</p> <p>Virtual learning is used to connect students and teachers, to bring in outside STEM expertise, or to exhibit student work.</p> <p>Classroom locations facilitate the integration of STEM content and teacher collaboration, i.e. common prep area or physical closeness of integrated subjects.</p> <p>A culture of inquiry and creativity exists among teachers and students through implementation of 21st Century skills in every class.</p>	<p>Classrooms are designed for collaborative work.</p> <p>Additional spaces are identified for students to use for collaboration or work areas.</p> <p>Virtual learning is used a way to connect students and teachers, to bring in outside STEM expertise, or to exhibit student work.</p> <p>Classroom locations facilitate the integration of STEM content and teacher collaboration.</p> <p>A culture of inquiry and creativity exists among all students, teachers, and administrators through implementation of 21st Century skills in every class.</p>

<p><b>1.5 School Schedules</b></p>	<p>Participating teachers have a common planning time within the school day.</p>	<p>Participating teachers have a common planning time within the school day.</p> <p>Scheduling supports STEM integration across two or more subjects, but not on a consistent basis.</p>	<p>Participating teachers have a common planning time within the school day.</p> <p>Scheduling supports STEM integration across two or more subjects, i.e. block schedule, co-teaching, etc.</p>	<p>Schedules allow for consistent teacher collaboration, co-teaching and integration of subjects.</p> <p>Schedules allow ample time for projects, teacher planning, and non-traditional courses.</p>
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**Artifact Examples:**

<p><b>1.1</b></p>	<ul style="list-style-type: none"> <li>• A fully formed STEM Leadership Team has led stakeholders in a collaborative design process to create a detailed STEM strategic plan grounded in research and in which actions toward the Tennessee STEM attributes are outlined.</li> <li>• The school provides evidence that a STEM culture has been established. For example: a consistent problem-solving method (engineering design process/scientific method) approach is used throughout the school.</li> <li>• Program leaders' quarterly communication of the STEM Action Plan secures participation and buy-in from STEM teachers and key stakeholders.</li> </ul>
<p><b>1.2</b></p>	<ul style="list-style-type: none"> <li>• A fully formed STEM 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 attributes are outlined.</li> </ul>
<p><b>1.3</b></p>	<ul style="list-style-type: none"> <li>• Evidence of Professional Development is provided and improves STEM-focused content knowledge (advanced academics, agriculture, architecture, biotechnology, computer programming, cybersecurity, energy, engineering, food science and nutrition, forensic science, healthcare science, graphic design, communications, finance, and/or information technology).</li> <li>• Sources of PD: state, district, STEM professionals, higher education faculty, job-embedded, model STEM/STEAM schools, researched based, and peer-to-peer.</li> </ul>
<p><b>1.4</b></p>	<ul style="list-style-type: none"> <li>• Classrooms are designed for collaboration. (e.g., tables, moveable desks)</li> <li>• Spaces are available for collaboration and project work. (e.g., white boards, posters, art tools, project materials) Facilities reflect a focus on STEM learning efforts. (e.g., technology, journals, science posters)</li> <li>• 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.</li> <li>• There is a focus on creativity, critical thinking, communication, and collaboration in all subject areas.</li> </ul>
<p><b>1.5</b></p>	<ul style="list-style-type: none"> <li>• Provide evidence that teachers have a set time they collaborate (quarterly, monthly, weekly, etc.) together to plan integrated lessons, share/co-create STEM activities and plan learning outcomes.</li> </ul>



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

**Attribute 2.1 Project-based and Problem-based Learning:** Quality STEM 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, and Mathematics. Problem solving learning at this school requires a thorough process of inquiry, knowledge building, and resolutions. Curriculum includes projects, 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 learning experiences require students to demonstrate knowledge and skills fundamental to the engineering design process and design thinking (e.g., brainstorming, researching, creating, testing, modifying).

**Attribute 2.3 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.

**Attribute 2.4 Exploring STEM Careers:** Quality STEM learning experiences help students better understand and personally consider STEM 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 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 School establishes curriculum expectations, monitoring, and accountability mechanisms that are reflectively revised to ensure a constancy of mission purpose (aligned resource allocation, integrated STEM curriculum development, teacher professional growth, and student results). Students use thinking and process skills. This includes considering alternative arguments or explanations, making predictions, interpreting their experiences, analyzing data, explaining their reasoning, 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 enrichment activities that take place before, after, or during school hours. (e.g. competitions, STEM exhibits, robotics, Science Olympiads, DECA, TSA, HOSA, FCCLA, Future Educators Association, FFA, Business Professionals of America, FCCLA, clubs, makerspaces, etc.)

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

Attributes	Early	Developing	Accomplishing	Model
<p><b>2.1 Frequency of PBL with Integrated Content Across Subjects</b></p>	<p>Units of PBL/Inquiry/ STEM instruction is aligned to current Tennessee state standards and include integrated STEM within science and mathematics and other content areas one time a year.</p>	<p>Units of PBL/Inquiry/ STEM instruction is aligned to current TN State Standards and include integrated STEM within science and mathematics and other content areas at least twice a year.</p>	<p>Units of PBL/Inquiry/ STEM instruction is aligned to current Tennessee state standards and include integrated STEM within science and mathematics and other content areas at least three quarters of the year.</p>	<p>Units of PBL/Inquiry/ STEM instruction is aligned to current Tennessee state standards and include integrated STEM within science and mathematics and other content areas throughout the academic year.</p>
<p><b>2.2 Engineering Design Process and Design Thinking Process</b></p>	<p>The learning experience includes no requirement that students develop thinking skills required in the engineering design process.</p>	<p>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.</p>	<p>The learning experience explicitly references the engineering design process and requires students to demonstrate thinking skills across multiple steps in the engineering design process.</p>	<p>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.</p>

<p><b>2.3 Quality of Technology Integration</b></p>	<p>Students have limited opportunities to use technology (e.g., drill and practice).</p>	<p>Computer-based/virtual technology tools are integrated in lessons.</p> <p>Students use technology in the investigative process including virtual, computer-based, mobile, and data collection devices.</p>	<p>Computer-based/virtual technology tools are integrated in lessons.</p> <p>Students use a variety of technology in the investigative process including: virtual, computer-based, mobile and data collection devices, web-based lessons, computer applications, researching, and reporting.</p>	<p>Teachers embed a variety of technology in the instructional process, including using technology as a facilitation of student learning in a transformative instructional manner.</p> <p>Students use a variety of technology in the investigative process including: 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.</p>
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<p><b>2.4 Exploring STEM Careers</b></p>	<p>Once a year, students participate in career exploration activities, which include opportunities to explore STEM careers, professional activities, and employability skills (e.g., online activities, guidance from teachers, guidance from business partners, career fair, etc.).</p>	<p>Twice a year, students participate in career exploration activities, which include opportunities to explore STEM careers, professional activities, and skills (e.g., online activities, guidance from teachers, guidance from business partners, career fair, etc.).</p>	<p>Quarterly, students participate in career exploration activities, which include opportunities to explore STEM careers, professional activities, and skills (e.g., online activities, guidance from teachers, guidance from business partners, career fair, etc.).</p>	<p>Monthly, students explore careers, including STEM 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.).</p>
<p><b>2.5 College and Career Readiness Skills</b></p>	<p>The school does not include and/or does not have evidence of this attribute in practice at this time.</p>	<p>Work is in progress to develop this attribute within the school. This element is included in the school's STEM planning document.</p>	<p>Lessons/activities require students to exercise employability skills (<a href="#">Tennessee Department of Education Employability Skills Checklist</a>).</p> <p>Lessons/activities require students to ask questions, define problems, and analyze and interpret data.</p> <p>Lessons/activities encourage students to effectively communicate and collaborate with their peers.</p>	<p>Lessons/activities require students to employability skills (<a href="#">Tennessee Department of Education Employability Skills Checklist</a>).</p> <p>Lessons/activities require students to ask questions, define problems, analyze and interpret data.</p> <p>Lessons/activities require students to effectively communicate and collaborate with their peers.</p>

			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.
<b>2.6 Integrity of the Academic Content (Including Cognitively Challenging Work)</b>	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).

<p style="text-align: center;"><b>2.7 Extended Learning STEM Activities</b></p>	<p>The school does not include and/or does not have evidence of this attribute in practice at this time.</p>	<p>Work is in progress to develop this attribute within the school. This element is included in the school's STEM planning document.</p>	<p>The school offers extracurricular activities that are engaged in by some of the students.</p> <p>Some of the students participate in STEM competitions onsite/online STEM exhibits, and/or in state and national STEM forums.</p>	<p>The school offers extracurricular activities that are engaged in by most of the students.</p> <p>Most of the students participate in STEM competitions on-site/online STEM exhibits, and/or in state and national STEM forums.</p>
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2.1	<p>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.</p> <ul style="list-style-type: none"> <li>• Students are able to articulate the relationship among the concepts they learned in the content disciplines in their created projects</li> <li>• The curriculum offers opportunities for student presentations of investigations and findings</li> <li>• There is evidence that students engage in regular "arguments from evidence" during classroom instruction</li> <li>• There are opportunities for students to interact with STEM professionals to support curriculum</li> <li>• There are opportunities that involve older students working with elementary/middle school students in the STEM program</li> <li>• A specialized science, math, and/or engineering program(s) is being used</li> <li>• There are opportunities for students to interact with museum/university/business partners to support curriculum</li> </ul>
2.2	<p>The Engineering Design Process/Design Thinking is referenced in all classes as a possible strategy to addressing a problem.</p> <ul style="list-style-type: none"> <li>• An entrepreneur component of the STEM program may be in place</li> <li>• Collaborative projects that require planning, research, discussion/debate, and presentations</li> <li>• Products that require students to analyze and interpret data, construct explanations and design solutions, and engage in argument from evidence</li> <li>• Experimentation that requires students to illustrate their understanding of STEM concepts</li> <li>• Peer/Self-assessment on products using rubrics</li> <li>• Solving problems using real-world applications</li> <li>• Student demonstrations that reflect mastery of STEM content and procedures</li> <li>• Portfolios that allow students to portray their learning via collections of personal work</li> </ul>
2.3	<p>Students are regular producers of websites, blogs, computer programs, videos, classroom digital products, etc.</p> <ul style="list-style-type: none"> <li>• Computer-based, online, mobile, virtual, and other technology tools are integrated into STEM classwork</li> <li>• Probes are used to collect and analyze data</li> <li>• Tablets are in use with apps specific to the topic</li> <li>• Graphing calculators may be used to solve problems at the upper elementary level. STEM industry related technology is available for student use</li> <li>• 21st century technology tool products by students are visible throughout the school</li> <li>• Teachers and students receive on-going access and opportunity to expand their proficiency in technology use</li> </ul>

2.4	<p>The learning experience requires students to complete tasks in a simulated or real STEM work environment in which they are working like STEM professionals. In addition, the experience includes an activity intentionally designed to help students explore the relevant STEM careers and their educational requirements.</p> <ul style="list-style-type: none"> <li>• A culminating project that integrates all the STEM content areas (capstone)</li> <li>• Student work created in collaboration with a business/community/postsecondary partnership</li> <li>• Speaker series, job shadowing, touring STEM business/industries, mentorships with students for projects/investigations</li> <li>• STEM career days/nights</li> <li>• Collaboration with teachers to design real world projects/problems</li> <li>• Partnership involvement in executing the STEM program, partnerships are purposeful, and mutually beneficial.</li> <li>• Museum or university partnerships, which may include virtual collaboration with partners</li> <li>• Survey shows changes in student mindsets around STEM careers</li> <li>• Usage of STEM career awareness modules (i.e., Learning Blade, etc.)</li> </ul>		
2.5	<p>The curriculum offers opportunities for student presentations of investigations and findings.</p> <ul style="list-style-type: none"> <li>• There is evidence that students engage in regular literacy tasks, “arguments from evidence,” during classroom instruction: <ul style="list-style-type: none"> <li>○ Lessons/activities require students to regularly exercise skills they will use in the workplace:</li> <li>○ Lessons/activities require students to demonstrate leadership and responsibility.</li> <li>○ Lessons/activities require students to present information effectively, and are aligned with the Tennessee learning standards.</li> <li>○ Lessons/activities require students to exercise time management and organize their work.</li> </ul> </li> </ul>		
2.6	<p>Classroom instruction is predominantly student-centered, and students are asked to think in complex ways and apply the knowledge and skills they have acquired.</p> <ul style="list-style-type: none"> <li>• Students are asked to create solutions and take action that further develops their skills and knowledge.</li> <li>• Students are asked to support their conclusions with evidence and explain their reasoning.</li> <li>• Students are asked to come up with alternative explanations or arguments and to make hypotheses or predictions.</li> </ul>		
2.7	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>Any MakerMinded Portfolio Activity (<a href="http://www.tn.makerminded.com">www.tn.makerminded.com</a>) including but not limited to:</p> <ul style="list-style-type: none"> <li>• Science Olympiad Team</li> <li>• Lego Robotics</li> <li>• Vex Robotics</li> <li>• DECA</li> <li>• TSA</li> <li>• HOSA,</li> <li>• Future Educators Association</li> </ul> </td> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li>• Business Professionals of America</li> <li>• FCCLA</li> <li>• FFA</li> <li>• School-wide or district science and engineering fair</li> <li>• Destination Imagination</li> <li>• Math Challenge Contests</li> <li>• Technology Student Association</li> <li>• eCybermission</li> <li>• Learning Blade</li> </ul> </td> </tr> </table>	<p>Any MakerMinded Portfolio Activity (<a href="http://www.tn.makerminded.com">www.tn.makerminded.com</a>) including but not limited to:</p> <ul style="list-style-type: none"> <li>• Science Olympiad Team</li> <li>• Lego Robotics</li> <li>• Vex Robotics</li> <li>• DECA</li> <li>• TSA</li> <li>• HOSA,</li> <li>• Future Educators Association</li> </ul>	<ul style="list-style-type: none"> <li>• Business Professionals of America</li> <li>• FCCLA</li> <li>• FFA</li> <li>• School-wide or district science and engineering fair</li> <li>• Destination Imagination</li> <li>• Math Challenge Contests</li> <li>• Technology Student Association</li> <li>• eCybermission</li> <li>• Learning Blade</li> </ul>
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**Artifact Examples:**

**Professional Development:** A Tennessee Designated STEM 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 program.

**Attribute 3.1 Quality STEM Professional Learning:** Quality STEM professional learning aligns with STEM 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 in order 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 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.**

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

				Teachers participate in externships and mentorships with higher education and industry to ensure progressive expectations for educators' application of content knowledge, curriculum design and delivery.
<b>3.2 Designing PBLs</b>	Teachers participate in PD sessions that provide Information and samples of project/problem-based learning STEM modules.	Teachers participate in PD sessions that provide samples and information on the development of project/problem-based learning STEM modules.	Teachers collaborate to custom design project/problem-based learning STEM modules.	Teachers collaborate to custom design project/problem-based learning STEM modules.  Higher education and industry partners contribute to the PBL design.  The STEM modules include the department's learning standards and integrate content areas and 21 <sup>st</sup> Century Learning Skills.

**Artifact Examples:**

<b>3.1</b>	<p>Documentation of STEM-specific professional learning for all STEM teachers that incorporates the following:</p> <ul style="list-style-type: none"><li>• Project/problem/place-based learning</li><li>• Integrated instruction</li><li>• Investigative research-based practices</li><li>• Collaborative planning practices</li><li>• Improve the STEM-focused content knowledge (advanced academics, agriculture, architecture, biotechnology, computer programming, cybersecurity, energy, engineering, food science and nutrition, forensic science, healthcare science, and/or information technology).</li></ul> <p>STEM teachers document integration of the following into their instructional practices:</p> <ul style="list-style-type: none"><li>• Attend content area national/regional conference</li><li>• Have tailored professional learning to their specific needs</li><li>• Participate in a job-embedded or practice-based approach to professional learning</li><li>• Attend content area state conference</li><li>• Participate in project/problem-based learning professional learning</li><li>• Participate in professional learning related to STEM integration</li><li>• Participate in professional learning to strengthen STEM content knowledge and skills</li><li>• Observe other STEM teachers (peer observations, instructional rounds, etc.)</li></ul>
<b>3.2</b>	<p>PBL units should include the following:</p> <ul style="list-style-type: none"><li>• Learning that is student-led, interdisciplinary, and engaged in real-world content and multiple solutions for student cooperation utilizing STEM knowledge and skills</li><li>• Portfolios that allow students to portray their learning via collections of personal work</li><li>• Group projects that require planning, research, discussion/debate, and presentations</li><li>• Written products that require students to analyze and interpret data, construct explanations and design solutions, and engage in argument from evidence</li><li>• Experimentation that requires students to illustrate their understanding of STEM concepts</li><li>• Authentic assessments on products using rubrics</li><li>• Student demonstrations that reflect mastery of STEM content and procedures</li><li>• A culminating project that integrates all the STEM content areas</li></ul>

**Achievement:** Assessments are incorporated to measure student outcomes and teacher instruction to ensure a strong, innovative, and cohesive STEM program. Each of the following attributes uses innovative assessment to sustain a well-rounded STEM 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 program. The assessment plan includes rubric-based performance assessments that require students to demonstrate knowledge of STEM 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 program.**

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

<p><b>4.2 Accountability (Data)</b></p>	<p>Teachers minimally use student data to guide instruction.</p> <p>Only state standardized tests are used.</p> <p>Data is only tracked for special populations.</p>	<p>Teachers and school staff use standardized test data to guide instruction.</p> <p>Teachers also collect formative data about students.</p>	<p>Teachers and school staff use state standardized test data, in addition to other standard assessments.</p> <p>Teachers collect formative data.</p> <p>All student data is tracked down to the individual student's needs, possibly through use of individual learning plans or specialized software.</p> <p>Data walls and a variety of other data tracking systems are employed.</p>	<p>Teachers and school staff use state standardized test data, in addition to other standardized state and national, district, and classroom assessments.</p> <p>Teachers collect formative data and maintain records for all students.</p> <p>All student data is tracked down to the individual students needs and each student has an individual education plan.</p> <p>Data walls and a variety of other data tracking systems are employed.</p> <p>Student data conferences are provided to help students understand their data.</p>
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**Artifact Examples:**

<b>4.1</b>	<p>A variety of assessments are incorporated to measure student outcomes and teacher instruction to ensure a strong, innovative, and cohesive STEM program. Examples of Data/Performance Assessments include:</p> <ul style="list-style-type: none"><li>• Portfolios that allow students to portray their learning via collections of personal work</li><li>• Group projects that require planning, research, discussion/debate, and presentations</li><li>• Written products that require students to analyze and interpret data, construct explanations and design solutions, and engage in argument from evidence</li><li>• Experimentation that requires students illustrate their understanding of STEM concepts</li><li>• Authentic assessments on products using rubrics that focus on solving problems using real-world applications</li><li>• Student demonstrations that reflect mastery of STEM content and procedures</li><li>• Culminating project that integrates all the STEM content areas</li></ul>
<b>4.2</b>	<p>Evidence that diagnostic, ongoing, and vertically and horizontally aligned formative and summative assessments are used for all students to drive instructional decisions.</p> <ul style="list-style-type: none"><li>• Built-in planning time for teachers to interpret student data and adjust their instruction accordingly</li><li>• Teachers provide evidence of an instructional change based on data</li><li>• There is evidence that students participate in self-evaluation and goal setting consistently</li></ul>

**Community and Postsecondary Partnerships:** Community and postsecondary STEM 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 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 in order to sustain a well-rounded STEM program.

**Attribute 5.1 Partners Support Instruction:** Direct experiences with STEM professionals, professional STEM work environments, and/or practical applications of STEM 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.

**Attribute 5.2 Work-based Learning:** STEM work-based learning experiences increase interests and abilities in fields requiring STEM skills for high school students. See the K-12 progression below:

Career-exploration WBL Methods			Pre-professional WBL Methods		Career-preparation WBL Methods		
Exploration			Immersion				
Industry Awareness	Career Awareness	Service Learning	Career Exploration	Service Learning	Clinical Experience	Service Learning	Career Training
Primarily grades K-5 but continuing into higher grades			Primarily grades 6-8 but continuing into upper grades		Primarily grades 9-12 but continuing into postsecondary		
<ul style="list-style-type: none"> <li>Foster career and workplace awareness</li> <li>Promote career exploration</li> <li>Strengthen motivation and informed decision-making skills</li> </ul>			<ul style="list-style-type: none"> <li>Deepen career and work readiness knowledge</li> <li>Develop personal qualities and workplace readiness skills</li> <li>Impart beginning professional skills</li> </ul>		<ul style="list-style-type: none"> <li>Develop technical knowledge and skills necessary for entry into a specific occupation</li> <li>Strengthen industry and career awareness, career exploration, preparation, and training</li> </ul>		

**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 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 skills and knowledge inside and outside of the classroom and increase their readiness for college and careers.

Attributes	Early	Developing	Accomplishing	Model
<p><b>5.1 Partners Support Instruction</b></p>	<p>Work is in progress to develop this attribute within the school.</p>	<p>Partners from industry, institutes of higher education, and technical centers are utilized to extend student learning.</p>	<p>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 implementation.</p>	<p>Students have direct experiences with STEM professionals in authentic environments.</p> <p>Field experiences involving industry partners are embedded within the design process and implementation of PBLs to provide authentic, real-world STEM content and industry skills to classroom instruction.</p> <p>Industry partners are a part of the decision-making process.</p>
<p><b>5.2 Work Based Learning</b></p>	<p>Students rarely have an active, work-based learning experience with an external STEM industry partner, either during or outside of the school day.</p>	<p>Students have at least one active, work-based learning experience annually with an external STEM industry partner, either during or outside of the school day. The WBL experience promotes industry and career awareness.</p>	<p>Students have two active, work-based learning experiences annually with an external STEM industry partner, either during or outside of the school day. The WBL experiences promote industry and career awareness and exploration.</p>	<p>Students have an active, work-based learning experience annually with an external STEM 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.</p>

<p style="text-align: center;"><b>5.3 Postsecondary Opportunities</b></p> <p><b>*High School Only</b></p>	<p>An early post-secondary opportunity (EPSO) plan is developed to encourage student success in high school to college transition.</p> <p>Online courses are not available.</p>	<p>An early post-secondary (EPSO) plan is in place and offers at least six college credits (e.g., AP, IB, certifications, dual enrollment).</p> <p>A technology plan is in place to provide online learning for students.</p>	<p>An early post-secondary (EPSO) plan is in place and offers at least 12 college credits (e.g. AP, IB, certifications, dual enrollment).</p> <p>HS Courses are enhanced by technology-based teaching methodologies and opportunities to obtain certifications (e.g. flipped class model, blended learning, MOOCs).</p>	<p>An early post-secondary (EPSO) plan is in place and offers at least 15 college credits (e.g. AP, IB, certifications, dual enrollment).</p> <p>Partners with industry and higher education collaborate with the high school staff to continually evaluate and improve course offerings.</p> <p>High school courses are enhanced by technology-based teaching methodologies and opportunities to obtain certifications (e.g., flipped class model, blended learning, MOOCs).</p>
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**Artifact Examples:**

<b>5.1</b>	<ul style="list-style-type: none"><li>• 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 careers.</li><li>• There are opportunities for students to interact with STEM professionals to support curriculum.</li></ul>
<b>5.2</b>	Students have access to and participate in: <ul style="list-style-type: none"><li>• Internships, mentorships, work-based learning personalized plans, industry visits. Evidence provided by agendas, sign-in sheets, and/or proof of work completed letters.</li></ul>
<b>5.3</b>	<ul style="list-style-type: none"><li>• A plan has been developed to provide postsecondary-level courses/dual credit, International Baccalaureate, articulated credit, and/or Advanced Placement.</li><li>• 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 distance learning courses to promote STEM careers.</li></ul>

## Resources Used in Development of the Tennessee STEM School Designation

Georgia STEM Program:

<http://www.bremencs.com/images/pdfs/STEMProgramCertificationRubricforElementarySchools.pdf>

Indiana STEM School Program:

[Indiana STEM School Application](#)

North Carolina STEM School and Leadership Program:

<http://www.dpi.state.nc.us/stem/schools/>

Ohio STEM School Program:

<https://education.ohio.gov/getattachment/Topics/Career-Tech/STEM/Updated-for-K-5-FY18-STEM-Application-Fall-2016.pdf.aspx>

STEM Schools Study – Outlier Research and Evaluation with University of Chicago:

<http://outlier.uchicago.edu/s3/>

Texas T-STEM School Program:

<http://www.tstemblueprint.org/>