

# K-5 STEM Standards Framework

<b>Teaching and Leading:</b>	<a href="mailto:virginia.mayfield@tn.gov">virginia.mayfield@tn.gov</a>
<b>Course Code(s):</b>	G25X42
<b>Prerequisite(s):</b>	None
<b>Credit:</b>	1
<b>Grade Level:</b>	K-5
<b>Teacher Endorsement(s):</b>	001, 002, 073, 074, 101, 120, 173, 198, 400, 401, 402, 403, 440, 466, 467, 468, 497, 499
<b>Required Teacher Certifications/Training:</b>	None

## Course Description

STEM Standards of Practice Framework for grades K-5 is a foundational course experience providing students the opportunity to deepen their understanding of the content connections that exist between science, technology, engineering, and mathematics (STEM).

This introductory K-5 course helps younger students begin developing introductory skills and a foundational knowledge base important to subsequent STEM fields of study. This course is intentionally designed to help prepare students for entry into the middle school STEM Foundations I course. It is important to note that this course may be implemented flexibly to meet individual district needs within the K-5 grade band.

Upon completion of this course, proficient students are able to:

- apply problem-solving skills with critical thinking to explore STEM related real-world challenges,
- identify and explain the steps in the core practices of science and engineering,
- conduct research to develop meaningful questions,
- define simple problem scenarios and scientific investigations,
- develop fundamental design solutions,
- engage in experimentation,
- conduct basic mathematical modeling and data analysis,
- effectively communicate solutions and scientific explanations to others, and
- articulate how technology is used across a wide range of STEM disciplines following opportunities to explore STEM career fields and occupations.

## Course Standards

### Problem-Resolution Skills

These standards are designed to engage students with specific skills and strategies needed for them to develop competencies in teamwork and problem-solving.

1. Investigate real-world problems or challenges requiring the synthesis of multiple sources of information
2. Use content-specific and precise vocabulary when communicating ideas related to STEM content
3. Develop collaboration skills in problem-solving in order to construct explanations, design solutions, or achieve common goals
4. Explore and use models of engineering design to develop solutions to engineering problems
5. Identify and understand technologies needed to develop solutions to problems
6. Understand and use technology in a responsible and ethical manner
7. Understand and use appropriate safety procedures for conducting STEM investigations

### Critical Thinking in Context

These standards are designed to equip students with specific skills and strategies needed for working with STEM related concepts.

1. Engage in critical reading and communicating of technical information
2. Develop claims and use evidence to form arguments
3. Engage in investigations through science and engineering practices to identify and define global issues, challenges, and real-world problems
4. Use research data to refine existing questions, problems, models, and arguments and/or to develop new questions, problems, models, and arguments
5. Discuss grade-appropriate systemic methodology (e.g. scientific or engineering design practices, etc.) to investigate global challenges and real-world problems
6. Analyze the limitations, risks, and impacts of technology

### Cause and Effect Relationships between STEM Disciplines

These standards are designed to equip students with specific skills and strategies needed for analyzing STEM-related issues and challenges.

1. Analyze interdisciplinary connections that exist within the STEM disciplines (as appropriate to the grade level) to answer complex questions and to investigate/develop solutions to real-world problems

2. Identify and analyze the impact of emerging global STEM trends and real-world challenges with local, state, national, and international implications
3. Explore, develop, test, and refine models used by scientists and engineers to solve problems
4. Identify community challenges and apply STEM content and practices to construct creative and innovative responses and solutions

### **STEM Fields Exploration**

These standards are designed to equip students with an understanding of STEM careers and occupations.

1. Investigate real-world problems or challenges that exist in different STEM fields synthesizing multiple sources of information
2. Analyze career opportunities and occupations that exist in a variety of STEM fields
3. Explore how technology is integrated into different career fields and occupations
  - a) Use Geographic Information Systems (GIS) tools to capture, store, manipulate, analyze, manage, and present spatial or geographic data
  - b) Explore coding fundamentals and concepts with engaging opportunities and applications
  - c) Use bioinformatics tools to capture, store, manipulate, analyze, manage, and present biological data

### **Standards Alignment Notes**

The STEM Standards of Practice Framework for Grades K-5 are supported by: the Standards for Mathematical Practices, the Science and Engineering Practices, the K-12 Computer Science Framework, and the P21: Partnership for 21<sup>st</sup> Century Skills Framework for 21<sup>st</sup> Century Learning.

Teachers 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, and mathematics content.

- Standards for Mathematical Practices  
[https://www.tn.gov/content/dam/tn/education/standards/math/std\\_math\\_standards\\_mathematical\\_practice.pdf](https://www.tn.gov/content/dam/tn/education/standards/math/std_math_standards_mathematical_practice.pdf)
- Science and Engineering Practices [https://www.tn.gov/content/dam/tn/education/standards/sci/sci\\_standards\\_reference.pdf](https://www.tn.gov/content/dam/tn/education/standards/sci/sci_standards_reference.pdf)
- K-12 Computer Science Framework  
<https://k12cs.org/navigating-the-practices/>
- P21: Partnership for 21<sup>st</sup> Century Skills Framework for 21<sup>st</sup> Century Learning  
<http://www.p21.org/our-work/p21-framework>