STEM Standards K-5

Teachers: View each grade level endpoint and the previous grade level endpoint to use for instruction.

	By the end of 2nd grade K-2 Learning Targets	By the end of 5th grade 3-5 Learning Targets
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.		
PRS.1 Investigate real-world problems or challenges requiring synthesis of multiple sources of information.	• Make observations about the natural or designed world. • Identify a problem in a story/piece of literature or a real-world scenario. • Apply knowledge from a previous, common experience to identify problems. • Investigate two to three pieces of evidence from multiple types of sources such as texts, videos, consult with industry partners to investigate the problem or challenge.	• Generate multiple questions using strategies. *Example: Question Formulation Technique (QFT)* • Collect two or more pieces of evidence from multiple types of sources such as texts, videos, consult with industry partners to investigate the problem or challenge. • Draw evidence from resources to gather information about the problem. • Sort and cite evidence based on importance to the problem or challenge.
PRS.2 Use content-specific and precise vocabulary when communicating ideas related to STEM content.	• Apply grade level appropriate math and science vocabulary. • Use precision of language such as: engineering, constraints, criteria, design, problem, solution, prototype, improvements, benefits, consequences, materials, engineering design process (EDP)/ design thinking, and technology.	• Apply grade level appropriate math and science vocabulary. • Use precision of language such as: engineering, constraints, criteria, design, problem, solution, prototype, improvements, benefits, consequences, materials, engineering design process (EDP)/ design thinking, and technology.

PRS.3 Develop collaboration skills in problem solving in order to construct explanations, design solutions, or achieve common goals.	• Draw scientific explanatory models or prototype and label parts.
	• Revising model or prototype and verbally sharing thinking.
	• Explain how different teams/groups can contribute to the overall design of a product.
	• Listen to others and give feedback using sentence stems. Examples:
	  ○ One idea would be…
	  ○ I agree with you because…
	  ○ I disagree with you because…
		• Draw a scientific explanatory model or prototype using processes and systems.
		• Identify strengths and needs for improvement and communicate this to a partner/small group.
		• Effectively communicates, shares, and presents prototype models to an audience of peers.
		• Evaluate how different teams/groups can contribute to the overall design of a product.
		• Respectfully provide and receive critiques from peers about a proposed procedure, explanation or model by citing relevant evidence and posing specific questions.

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Problem Resolution Skills		
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	By the end of 2nd grade K-2 Learning Targets	**By the end of 5th grade** 3-5 Learning Targets
PRS.4 Explore and use models of engineering design to develop solutions to engineering problems.	- Use the engineering design process in a 3 or 5-step format. (PreK-K three step) - Empathize with stakeholders in the design process by finding practical solutions to social, cultural, and environmental global issues.	- Analyze data to determine if a design solution works. - Empathize and develop questions for stakeholders in design by finding practical solutions to social, cultural, and environmental global issues.
PRS.5 Identify and understand technologies needed to develop solutions to problems	- Identify that a technology is anything made by people that meets a need or solves a problem. - Know and use a wide variety of materials that are available in the STEM classroom. - Determine strength and purpose of materials. - Analyze existing materials. - Select appropriate tools to be used based on their purpose (length, weight, etc). - Build on existing ideas and improve ideas.	Articulate how technology is used across a wide range of STEM disciplines.
PRS.6 Understand and use technology in a responsible and ethical manner.	- Understand how to take care of the hardware of a computer. - Demonstrate the use of age appropriate technology. - Recognize the risks and benefits of technology.	- Explore appropriate and safe sites for learning and research. - Recognize the intended and unintended benefits of technology.
PRS.7 Understand and use appropriate safety procedures for conducting STEM investigations.	- Follow 2-3 step directions using prompt/cue. - Follow age appropriate lab safety procedures. - Understand what safety tools are needed to safely conduct a STEM investigation.	- Follow 4-5 step directions using prompt/cue. - Follow age appropriate lab safety procedures.

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	By the end of 2nd grade K-2 Learning Targets	By the end of 5th grade 3-5 Learning Targets
Critical Thinking Skills: These standards are designed to equip students with specific skills and strategies needed for working with STEM related concepts.		
CTS.1 Engage in critical reading and communicating of technical information	• Use images in text (e.g., a diagram showing how a machine works) to accomplish a task. • Communicate evidence from experiment/design and share results with others. • Describe key ideas or details from a text read aloud or information presented orally or through other media.	• Explain the relationships between two or more ideas, or concepts in a scientific, or technical text. • Construct an explanation of observed relationships (e.g., the distribution of plants in the backyard). • Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. • Obtain and combine information from text, experiments, and/or other reliable media to explain phenomena or solutions to a design problem.
CTS.2 Develop claims and use evidence to form arguments	• Identify arguments that are supported by evidence. • Analyze why some evidence is relevant to a scientific question and some is not. • Distinguish between opinions/inference and evidence in one's own explanations. • Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence. • Construct an argument with evidence to support a claim.	• Compare and refine arguments based on an evaluation of the evidence presented. • Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation. • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.
CTS.3 Engage in investigations through science and engineering practices to identify and define global issues, challenges, and real-world problems	• Identify and explore an issue and/or challenge. • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. • Make observations (firsthand or from media) and/or measurements of a proposed object, tool, or solution to determine if it solves a problem or meets a goal.	• Imagine and plan solutions to solve real world issues and/or challenges in the world. • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.

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Critical Thinking Skills: These standards are designed to equip students with specific skills and strategies needed for working with STEM related concepts.		
	By the end of 2nd grade K-2 Learning Targets	**By the end of 5th grade** 3-5 Learning Targets
CTS.4 Use research data to refine existing questions, problems, models, and arguments and/or to develop new questions, problems, models, and arguments	• Understand data and its purpose. • Analyze data from tests of an object or tool to determine if it works as intended. • Use and share pictures, drawings, and/or writings of observations to identify patterns in findings. • Test two different prototypes of the same proposed object, tool, or process to determine which better meets criteria for success based on data results. • Identify and interpret data from an experiment or tested solution.	• Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. • Compare and contrast data by different groups in order to discuss similarities and differences in their findings. • Analyze data to refine a problem statement or the design of a proposed object, tool, or process. • Identify and interpret data from an experiment or tested solution. • Test two or more different prototypes of the same proposed object, tool, or process to determine which better meets criteria for success and failure points identified in data.

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Teachers: View each grade level endpoint and the previous grade level endpoint to use for instruction.

<table>
<tr>
<td colspan="3">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.</td>
</tr>
<tr>
<td></td>
<td>K-2 Learning Targets</td>
<td>3-5 Learning Targets</td>
</tr>
<tr>
<td>CER.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</td>
<td>

- Examine and relate how science, technology, engineering, or math disciplines can be used to communicate a solution to a real world problem.
- Identify examples of math, science, social studies, English, and engineering in our world.

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<td>

- Research and connect at least two or more disciplines that integrate science, technology, engineering or mathematics content to communicate a solution to a real world problem.
- Generate questions from different content perspectives.
- Apply science, technology, mathematics and engineering concepts to answer complex questions.
- Create a solution to address a real-world problem by using knowledge from other content areas.

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<tr>
<td>CER.2: Identify and analyze the impact of emerging global STEM trends and real-world challenges with local, state, national, and international implications.</td>
<td>

- Identify how a local STEM trend affects the community.
- Analyze causes of local STEM trends.
- Identify an age/grade appropriate STEM trend in your community and the impact on your community.
- Explore STEM trends in your community.

</td>
<td>

- Research age/grade appropriate STEM trends that impact our state, nation, or global community.
- Generate and answer questions about a topic or STEM trend.
- Analyze the impact of global issues and real world problems at the local, state, national, and international levels and how STEM trends have solved them.
- Identify intended and unintended benefits and/or consequences.

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<tr>
<td>CER.3: Explore, develop, test, and refine models like scientists and engineers to solve problems.</td>
<td>

- Explore and develop physical models to represent relationships in the natural world.
- Use models to make predictions and/or develop a plan for a prototype.
- Develop a model using an example to describe scientific concepts.
- Recognize that there are limits to models as models can change and grow over time.

</td>
<td>

- Explore and develop physical, conceptual, and mathematical models to represent relationships in the natural world.
- Utilize digital tools to create models that can simulate real-life scenarios.
- Use models to make predictions and/or develop a plan for a prototype.
- Develop a model using an analogy, example, or abstract representation to describe a scientific concept.
- Recognize that there are limits to models as models can change and grow over time.

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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.		
	K-2 Learning Targets	**3-5 Learning Targets**
CER.4: Identify community challenges and apply STEM content and practices to construct creative and innovative responses and solutions	• Use information from observations (firsthand and digital media) to identify community challenges. • Collaborate and brainstorm to design a solution to a problem affecting the community. • Compare multiple solutions to a problem and give peer to peer feedback. • Use tools and/or materials to design, or build a prototype that solves a community challenge.	• Use information from observations (firsthand and digital media) to identify community challenges. • Collaborate and brainstorm with peers to solve a problem evaluating all solutions to communicate creative and innovative solutions. • Use tools and/or materials to design, or build a prototype that solves a community challenge. • Participate in a school-wide design challenge.

STEM Standards K-5

Teachers: View each grade level endpoint and the previous grade level endpoint to use for instruction.

STEM Fields Exploration These standards are designed to equip students with specific skills and strategies needed for analyzing STEM related issues and challenges specific to career opportunities and exploring careers.		
	K-2 Learning Targets	**3-5 Learning Targets**
SFE.1: Analyze career opportunities and occupations that exist in a variety of STEM fields.	• Identify the difference between engineers that design solutions to problems, and scientists that discover our natural seen and unseen world. • Understand generalized STEM fields (engineer, scientist, farmer) by discussing responsibilities, contributions and impacts in the specified field.	• Analyze career opportunities in STEM field occupations (electrical engineer, biologist, agricultural engineer) by discussing responsibilities, contributions and impacts in the specified field. • Understand specific STEM fields (electrical engineer, agriculture engineer, biochemist) by discussing responsibilities, contributions and impacts in the specified field.
SFE.2: Explore and use Geographic Information Systems (GIS) tools to capture, store, manipulate, analyze, manage, and present spatial or geographic data.	• Explore how technology is integrated into different career fields and occupations. • Understand GIS tools are used for mapping information. • Create a visual of at least two or more data points utilizing a map. • Utilize maps to analyze spatial data. (ex. How many blocks is it from the store to the school?). • Utilize both online and traditional mapping tools to collect and present data with support. (paper maps, Google Earth, ArcGIS).	• Explore how technology is integrated into different career fields and occupations • Create a visual of at least three or more data points utilizing a map. • Utilize maps to analyze geographic data. • Utilize both online and traditional mapping tools independently to collect and present data. (paper maps, Google Earth, ArcGIS) • Create a map that displays data to convey a specific purpose
SFE.3: Explore coding fundamentals and concepts with engaging opportunities and applications.	• Understand coding directionality. • Utilizing grade-level appropriate content specific coding vocabulary (algorithm, code, decompose, debugging). • Engage in logical sequencing of events. (basic coding). • Code basic programs with grade-appropriate technology. • Explore how technology is integrated into different career fields and occupations.	• Building code with conditionals such as "if then relationships." • Engage in career specific coding tasks (computer scientist, software programmer). • Code basic programs with grade-appropriate technology. • Recognize the applications for coding in the world around us. • Explore how technology is integrated into different career fields and occupations.

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STEM Fields Exploration		
These standards are designed to equip students with specific skills and strategies needed for analyzing STEM related issues and challenges specific to career opportunities and exploring careers.		
	K-2 Learning Targets	**3-5 Learning Targets**
SFE.3: Explore and use bioinformatics tools to capture, store, manipulate, analyze, manage, and present biological data.	• Record observations on biological topics (ex. Plant growth, number of butterflies in a garden). • Create graphs of observed biological phenomenon. • Recognize that math is a tool utilized in science. • Explore how technology is integrated into different career fields and occupations.	• Research, collect, and present data on a biological phenomenon utilizing a chart, spreadsheet, or graph. • Recognize the broad application and importance of bioinformatics on data usage. • Utilize both online and traditional data collecting tools (ex. Google Sheets, Excel, paper chart). • Combine 2 or more data sets to affirm a position. • Explore how technology is integrated into different career fields and occupations.

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