Maryland State STEM Standards of Practice Framework Grades K - 5

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Maryland State Department of Education

Preparing World-Class Students

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Introduction

STEM Education

STEM education is an approach to teaching and learning that integrates the content and skills of science, technology, engineering, and mathematics. STEM Standards of Practice guide STEM instruction by defining the combination of behaviors, integrated with STEM content, which are expected of a proficient STEM student. These behaviors include engagement in inquiry, logical reasoning, collaboration, and investigation. The goal of STEM education is to prepare students for post-secondary study and the 21st century workforce.

STEM education removes the artificial barriers that isolate content and allows for an integrated instructional approach. The curriculum should allow students to develop life skills and apply content knowledge within a real world context. STEM education is active and focuses on a student-centered learning environment. Students engage in questioning, problem solving, collaboration, and hands-on activities while they address real life issues. In STEM education, teachers function as classroom facilitators. They guide students through the problem-solving process and plan projects that lead to mastery of content and STEM proficiency. STEM proficient students are able to answer complex questions, investigate global issues, and develop solutions for challenges and real world problems while applying the rigor of science, technology, engineering, and mathematics content in a seamless fashion. STEM proficient students are logical thinkers, effective communicators and are technologically, scientifically, and mathematically literate.

STEM Education Pipeline

Elementary School

The development of STEM proficient students begins in elementary schools. In the elementary grades, students apply the rigor of science, technology, engineering, and mathematics content and the STEM Standards of Practice while engaged in learning activities that investigate the natural world. Students explore technology and engineering solutions and appropriately apply the concepts of mathematics in order to understand and address real life issues and solve problems or challenges. As students progress through elementary school they will begin to independently integrate the STEM Standards of Practice. They will understand how to apply the roles and views of STEM career professionals and analyze real world STEM issues, problems, or challenges as they incorporate STEM content, skills, and practices and other disciplines such as social studies, performing arts, health, and creative movement.

Middle School

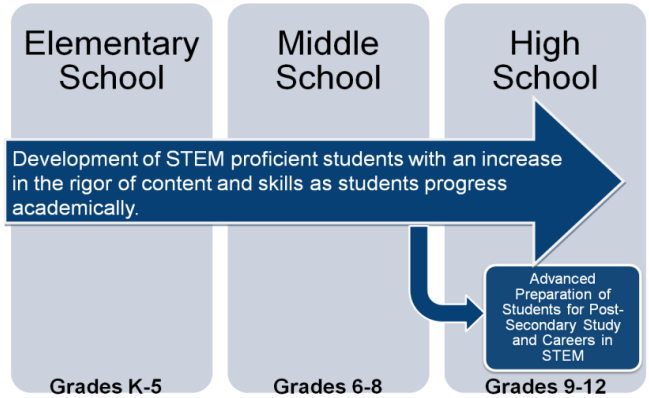
STEM education in middle school builds upon the foundational skills developed by students throughout elementary school. STEM essential skills and knowledge are further developed through guided instruction by the middle school teacher. Teachers facilitate learning activities that intentionally allow for middle school students to analyze and integrate content from science, technology, engineering, and mathematics to investigate global issues, answer complex questions, and develop solutions for challenges and real world problems. Middle school students will ask relevant questions, conduct research, refine questions based on research, and develop new questions that are relevant to understanding problems, global issues, or

challenges. Teachers will also facilitate learning activities that allow middle school students to refine critical thinking skills by applying scientific investigation and the engineering design process. By the end of eighth grade, students will be able to independently synthesize multi-disciplinary content to answer complex questions, investigate global issues, and develop solutions for challenges and real world problems.

High School

There are two goals for STEM education in high school. The first goal is on the development of STEM proficient students. All students will continue to grow in their STEM proficiency as they progress from grades 9:12. Students demonstrate independence and become more focused and sophisticated in their approach to answering complex questions, investigating global issues, and developing solutions for challenges and real world problems. STEM proficient students graduate with the basic skills and knowledge required to pursue post-secondary study or work in any field.

The second goal for STEM education in high school is on the advanced preparation of students for post-secondary study and careers in science, technology, engineering, or mathematics. High school provides a unique opportunity for students to explore different career paths and college majors through advanced coursework, career academies, magnet programs, STEM academies, specialized STEM programs, internships, and dual enrollment opportunities. Specific programs to address the needs for advanced preparation of students shall be determine by individual schools systems.



Overview:

In September 2008, Governor Martin O'Malley convened a P-20 STEM Task Force to discuss the state of STEM education in Maryland. As a result of the task force work, specific recommendations were made aimed at establishing Maryland as a global leader in the development of its workforce of the future, STEM-based research, and economic development infrastructure. The task force's recommendations were included in Maryland's application for a Race to the Top Grant. The grant describes twelve STEM-related projects, including developing STEM-based curriculum. The curriculum development process began in 2011 when Maryland State Department of Education staff specialists joined with stakeholders from across the state to define STEM education and develop STEM Standards of Practice. A total of 961 stakeholders reviewed and provided input on the STEM Standards of Practice via an on-line survey and face-to-face meetings. Stakeholders included representatives from all 24 Maryland local school systems, businesses and governmental agencies, colleges and universities, and other members of the community. In April 2012, the Maryland State Board of Education accepted the Maryland State STEM education definition and STEM Standards of Practice.

The development of the Maryland State STEM Standards of Practice Frameworks began in 2012 when the Office of STEM Initiatives convened multidisciplinary design teams. Design teams consisted of Maryland educators representing grades K-12 and higher education. The design teams identified what students should know and do to demonstrate proficiency with each STEM Standard of Practice by the end of grades K, 2, 5, 8, and 12. The Maryland State Department of Education staff and other stakeholders reviewed and refined the work of the design team. This document represents the culminating work of the design team and other stakeholders in identifying the essential skills and knowledge of STEM proficient students.

The purpose for the Maryland State STEM Standards of Practice Frameworks is to lay a foundation of STEM Education for all students. The Frameworks provide teachers and students a consistent approach to implementing STEM education and will provide guidance for teachers as they develop STEM centric units or lessons that focus on answering complex questions, investigating global issues, and developing solutions for challenges and real world problems.

Implementation of the Maryland State STEM Standards of Practice Frameworks

The Maryland State STEM Standards of Practice cross all grade levels and disciplines. Instruction in STEM education is a shared responsibility within a school. Therefore, all classroom teachers, supporting teaching staff, and special area teachers (e.g.: special education, gifted and talented, enrichment programs, afterschool programs, summer programs) can use the Maryland State STEM Standards of Practice Frameworks to engage students in STEM activities and tasks that develop STEM proficiency. Students should be given the opportunity to practice the essential skills and knowledge described while learning content. Implementation could occur through projects/themes that span multiple disciplines or through appropriate content-based infusion.

Limitations of the Frameworks

1. The Maryland State STEM Standards of Practice Framework sets the foundation for curriculum development by identifying process standards that are designed to be used with content standards.
2. The Maryland State STEM Standards of Practice are holistic in nature and have equal importance towards the development of STEM proficient students. The Framework is not intended to convey a hierarchical or sequential order for essential skills and knowledge, proficiencies, or standards.
3. The Maryland State STEM Standards of Practice Framework are written in grade bands to give school systems flexibility in the incorporation of STEM Standards of Practice in various content areas. Teachers should promote the development of the essential skills and knowledge over the course of grades K-5, 6-8, and 9-12.
4. The Maryland State STEM Standards of Practice Framework is a curriculum guide for educators. Teachers will need to plan accommodations, interventions, or enrichments required for special need students, English language learners, or gifted and talented students. Individual school systems can determine the appropriate modifications to meet the needs of their diverse populations.

STEM Education in Elementary Schools

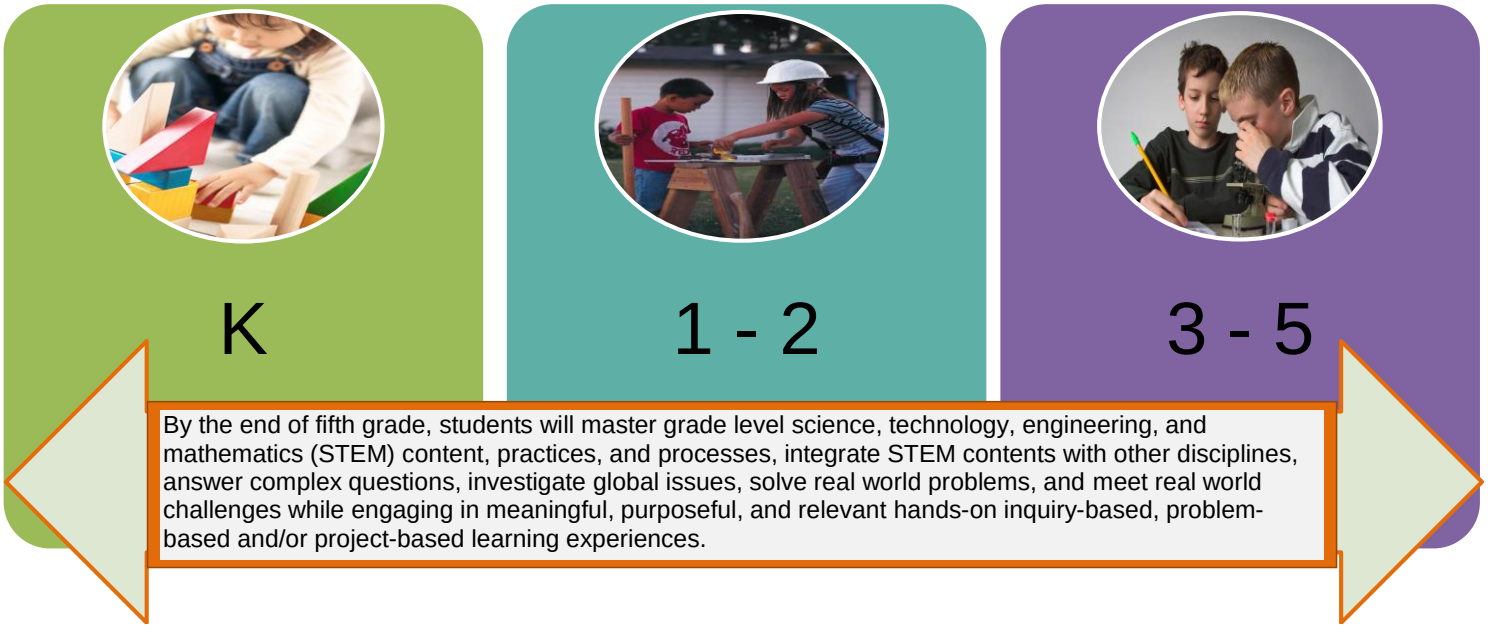
In elementary STEM classrooms, students are actively engaged in questioning and hands-on activities while they investigate global issues, and solve real world problems, and/or challenges. Teachers facilitate student engagement, arouse student's questioning, guide students through the problem-solving process, and plan student projects that center on student's interest. As early as kindergarten, their learn to: ask and answer questions about real-life topics that affect their lives and the lives of others around them, solve problems, and explore STEM-related careers by learning and role-playing what scientists, technologists, technicians, engineers and mathematicians do in their career field. Grade: Kindergarten, students should have been introduced to STEM Standards of Practice that will engage them in scientific process, Maryland Technology Literacy Standards for Students, engineering design processes, and mathematics content and practices.

As students mature in age, first and second grade students begin to apply, with some assistance from the teacher, science, technology, engineering, and mathematics content while engaging in activities that focus on real-world questions, issues, problems or challenges. Students begin to independently explore real-world problems, apply the process of problem solving, scientific process, engineering design process, and Standards for mathematical Practices, integrate STEM Standards of Practice, form STEM teams, and work cooperatively and collaboratively in groups.

Grades: First through Second, students will have a clear understanding of STEM content, skills, and practices, and they would have been exposed to inquiry-based, problem-based, and project-:based learning. Beginning in the third grade, students focus on demonstrating an understanding of how to connect science, technology, engineering and mathematics content, practices or processes while engaging in inquiry-based, problem-based, and project-based learning activities. By the end of third grade, students will be able to integrate STEM content, practices and processes to other disciplines when asking questions, solving problems, or meeting challenges. Students should also begin to apply the STEM Standards of Practice that will engage them in scientific process, Maryland Technology Literacy Standards for Students, engineering design processes, and mathematics content and practices.

By the end of fourth grade, students will be able to: design projects that are innovative and creative, analyze complex issues, solve complex problems and/or challenges, and independently apply STEM Standards of Practice into STEM activities. Students role play STEM professionals while engaged in STEM teams, incorporate engineering design process, science practices and Standards for Mathematical Practices into STEM activities, and logical reasoning when addressing or solving STEM related issues, problems, and/or challenges.

Grades: Third through Fifth, students will be able to independently demonstrate grade appropriate proficiency in all four STEM content areas, research various types of STEM subject matter experts in STEM fields, perform a STEM subject matter expert role when engaged in STEM teams, integrate other disciplines when engaging in a STEM lesson and/or project, and evaluate whether they have appropriately applied the STEM Standards of Practice while engaged in STEM activities. Student should also be able to independently demonstrate the science practices and Standards for Mathematical Practices, all K - 5 Maryland Technology Literacy Standards for Students, engineering design process, and inquiry-base, problem-base and project-base learning processes.



Blue = glossary terms; Purple = Maryland State Curriculum Standards

Elementary STEM Standards of Practice and Framework

The purpose for having Elementary STEM Standards of Practice and Framework is to lay a foundation of STEM Education for all students. STEM education is embedded in all content areas, specifically science, technology, engineering and mathematics. This document was designed by teachers and STEM coordinators from various grade levels, special education, English language learner, and English for speakers of other languages, and gifted and talented programs.

How to Read this Document

The curriculum writers approached the STEM Standards of Practice holistically: meaning, equal emphasis is given to each STEM Standards of Practice making each STEM Standards of Practice very important. The writers also applied a Transdisciplinary approach to STEM education where students answer complex questions, investigate global issues, and develop solutions to real world problems or challenges.

Overall Document Organization

The STEM Standards of Practice and Framework are comprised of seven practices. Each practice title is listed with a STEM proficient student statement explaining what a STEM proficient student will demonstrate. Each STEM Standard of Practice may list two or more student proficiencies, which are uppercase, letter A, B… A STEM proficiency statement is the behavior students are to demonstrate while engaged in STEM task over a course or year. The section identifying K, 2 and 5 represents Grade: Kindergarten, Grades: First through Second, and Grades: Third through Fifth. The essential skills and knowledge section includes a precursor statement explaining the expectation and support students will need to become a STEM proficient student. This section also contains skills and knowledge students will learn. Note: These bullets are not inclusive of all skills and knowledge students may demonstrate while engaging in STEM activities or tasks. Appendix A includes glossary words, and Appendix B is a list of references and online recourses.

Who is responsible for STEM Standards of Practice and Framework?

STEM is for all students. Therefore, all elementary classroom teachers, support teaching staff, special area teachers: art, music, library, physical education, inclusive or special education, gifted and talented, English language learners, and English for speakers of other languages, enrichment programs, afterschool programs and summer programs can use these STEM Standards of Practice and Framework to engage student in STEM activities and tasks. School administrators can also apply STEM Standards of Practice and Framework into the daily instruction in ELA, mathematics, social studies, science, and other discipline academic time blocks.

Formatting Notes: Black Print – Essential skills and knowledge identified by Maryland educators. These statements are intended to help teachers develop common understanding and valuable insights into what a student must know and be able to do to demonstrate proficiency with each STEM Standard of Practice; **Blue Print** : Glossary terms**;** and ***Purple Print*** – Essential skills and knowledge from other Maryland State Curriculum Standards.

Blue = glossary terms; Purple = Maryland State Curriculum Standards

Maryland State STEM Standards of Practice

1. **Learn and Apply Rigorous Science, Technology, Engineering, and Mathematics Content**

   STEM proficient students will learn and apply rigorous content within science, technology, engineering, and mathematics disciplines to answer complex questions, to investigate global issues, and to develop solutions for challenges and real world problems.

   A. Demonstrate an understanding of science, technology, engineering, and mathematics content.
   B. Apply science, technology, engineering, or mathematics content to answer complex questions, to investigate global issues, and to develop solutions for challenges and real world problems.

2. **Integrate Science, Technology, Engineering and Mathematics Content**

   STEM proficient students will integrate content from science, technology, engineering, and mathematics disciplines as appropriate to answer complex questions, to investigate global issues, and to develop solutions for challenges and real world problems.

   A. Analyze interdisciplinary connections that exist within science, technology, engineering, and mathematics disciplines and other disciplines.
   B. Apply integrated science, technology, engineering, mathematics content, and other content as appropriate to answer complex questions, to investigate global issues, and to develop solutions for challenges and real world problems.

3. **Interpret and Communicate Information from Science, Technology, Engineering, and Mathematics**

   STEM proficient students will interpret and communicate information from science, technology, engineering, and mathematics to answer complex questions, to investigate global issues, and to develop solutions for challenges and real world problems.

   A. Identify, analyze, and synthesize appropriate science, technology, engineering, and mathematics information (text, visual, audio, etc.).
   B. Apply appropriate domain-specific vocabulary when communicating science, technology, engineering, and mathematics content.
   C. Engage in critical reading and writing of technical information.
   D. Evaluate and integrate multiple sources of information (e.g.: quantitative data, video and multimedia) presented in diverse formats.
   E. Develop an evidence-based opinion or argument.
   F. Communicate effectively and precisely with others.

4. **Engage in Inquiry**

   STEM proficient students will engage in inquiry to investigate global issues, challenges, and real world problems.

   A. Ask questions to identify and define global issues, challenges, and real world problems.
   B. Conduct research to refine questions and develop new questions.

5. Engage in Logical Reasoning

STEM proficient students will engage in logical reasoning to answer complex questions, to investigate global issues, and to develop solutions for challenges and real world problems.

A. Engage in critical thinking.
B. Evaluate, select, and apply appropriate systematic approaches (scientific and engineering practices, engineering design process, and/or Standards for mathematical Practices).
C. Apply science, technology, engineering, and mathematics content to construct creative and innovative ideas.
D. Analyze the impact of global issues and real world problems at the local, state, national, and international levels.

6. Collaborate as a STEM team

STEM proficient students will collaborate as a STEM team to answer complex questions, to investigate global issues, and to develop solutions for challenges and real world problems.

A. Identify, analyze, and perform a STEM specific subject matter expert role.
B. Share ideas and work effectively with a STEM focused multidisciplinary team to achieve a common goal.
C. Listen and be receptive to ideas of others.
D. Analyze career opportunities that exist in a variety of STEM fields relevant to the STEM focused multidisciplinary team's goal.

7. Apply Technology Strategically

STEM proficient students will apply technology appropriately to answer complex questions, to investigate global issues, and to develop solutions for challenges and real world problems.

A. Identify and understand technologies needed to develop solutions to problems or construct answers to complex questions.
B. Analyze the limits, risks, and impacts of technology.
C. Engage in responsible/ethical use of technology.
D. Improve or create new technologies that extend human capability.

STEM Standard of Practice 1: **Learn and Apply Rigorous Science, Technology, Engineering, and Mathematics Content** *STEM proficient students will learn and apply rigorous content within science, technology, engineering, and mathematics disciplines to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.*		
A. Demonstrate an understanding of science, technology, engineering, and mathematics content.		
Grade: Kindergarten	**Grades: First through Second**	**Grades: Third through Fifth**
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Name concepts presented in grade level *science*, *technology*, *engineering,* and *mathematics* content. • Match picture connections between content and real life. • Retell which *science practices and Standards for Mathematical Practices* are being used when solving problems. • Identify the steps of the engineering design process when engaged in STEM activities. • Identify the *Maryland Technology Literacy Standards for Students*.	• Recall and apply concepts presented in grade level *science*, *technology*, *engineering*, and *mathematics* content. • Make connections between content and real life. • Apply *Maryland Technology Literacy Standards for Students, science practices,* or *Standards for Mathematics Practices* to use when solving problems. • Use the engineering design process when engaged in STEM activities to solve real world problems.	• Explain concepts presented in grade level science, technology, *engineering*, and *mathematics* content. • Describe connections between *science, technology*, *engineering,* and *mathematics* content and real life. • Give examples of *science practices* or *Standards for Mathematics Practices* being used when solving problems. • Write a plan using the engineering design process when engaged in STEM activities. • Demonstrate an understanding of *Maryland Technology Literacy Standards for Students* when engaged in STEM activities.

STEM Standard of Practice 1: **Learn and Apply Rigorous Science, Technology, Engineering, and Mathematics Content** *STEM proficient students will learn and apply rigorous content within science, technology, engineering, and mathematics disciplines to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.*		
B. Apply science, technology, engineering, and mathematics content to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.		
Grade: Kindergarten	**Grades: First through Second**	**Grades: Third through Fifth**
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Begin to think and ask questions about science and mathematics content. • Recall *science* or *mathematics* content to answer questions or solve real world problems. • Name *science* or *mathematics* content or practices when exploring global issues. • Tell how *science, technology*, *engineering*, or *mathematics* content is used by people every day.	• Determine how *science, technology*, *engineering,* or *mathematics* content can be used to better human life. • Apply *science, technology*, *engineering*, or *mathematics* content, practice, or process when identifying and defining global issues. • Choose the appropriate *science* and *mathematics* content to ask and answer complex questions or solve real world problems. • Apply problem-solving skills to *science* and *mathematics* content.	• Employ problem solving skills to *science* and *mathematics* content. • Use the appropriate *science*, *technology, engineering*, and *mathematics* content to solve real world problems or ask and answer complex questions. • Show the appropriate *science, technology*, or *mathematics* content when charting historical societal changes. • Examine ways *science*, *technology*, *engineering*, or *mathematics* content knowledge is used to better human life.

STEM Standard of Practice 2: **Integrate Science, Technology, Engineering, and Mathematics Content** *STEM proficient students will integrate content from science, technology, engineering, and mathematics disciplines as appropriate to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.*		
A. Analyze interdisciplinary connections that exist within the science, technology, engineering, and mathematics disciplines and other disciplines.		
Grade: Kindergarten	**Grades: First through Second**	**Grades: Third through Fifth**
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Discover the connections between *science, technology, engineering*, and *mathematics* disciplines and other disciplines. • Retell information from *science, technology, engineering*, and *mathematics* information to answer questions, investigate global issues, or solve real world problems or challenges. *(CCSS RI.K.2)* • Begin to understand *science practices* or *Standards for Mathematical Practices* when solving real world problems or challenges.	• Explain connections between *science, technology, engineering*, and *mathematics* disciplines and other disciplines. • Illustrate the appropriate connections between *science*, *technology*, *engineering*, and *mathematics* content to answer complex questions, investigate global issues, or solve a real world problems or challenges. • Identify and apply *science practices* or *Standards for Mathematical Practices* when answering complex questions, investigating global issues, and solving real world problems or challenges.	• Demonstrate how to connect *science*, *technology*, *engineering*, and *mathematics* disciplines to other disciplines. • Critique the appropriate connections between *science*, *technology*, *engineering*, and *mathematics* content to answer complex questions, investigate global issues, or solve real world problems or challenges. • Explain the process of using *science practices* or Standards for Mathematical Practices when answering complex questions, investigating global issues, or developing solutions to real world problems or challenges.

STEM Standard of Practice 2: **Integrate Science, Technology, Engineering, and Mathematics Content**

STEM proficient students will integrate content from science, technology, engineering, and mathematics disciplines as appropriate to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

B. Apply integrated science, technology, engineering, and mathematics content to answer complex questions, to investigate global issues, and to develop solutions for challenges and real world problems.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Recall connections between grade level *science* and *mathematics* content. • Retell *science* or *mathematics* content to answer questions or solve problems.*(CCSS RI.K.2)* • Match one or more STEM content areas using pictures or objects to answer questions, explore global issues or solve real world problems or challenges.	• Identify and apply the appropriate *science* information when investigating global issues or solving real world problems or challenges. • Compare and contrast information from *science*, *technology*, *engineering*, and *mathematics* to answer complex questions. *(CCSS RI.2.9)* • Demonstrate the ability to connect multiple contents when answering complex questions, investigating global issues, or solving real world problems or challenges and justify those connections. *(CCSS Add Math & RELA)*	• Summarize and apply *science*, *technology*, *engineering*, and *mathematics* content when answering complex questions, investigating global issues and solving real world problems or challenges. *(CCSS RI.5.2)* • Demonstrate an understanding of how to integrate practices, as appropriate to other disciplines, when answering complex questions, investigating global issues, defining real world problems, developing models, or developing solutions to real world problems or challenges. • Explain why one connects multiple contents when answering complex questions, investigating global issues, defining real world problems, developing models, and developing solutions to real world problems or challenges.

STEM Standard of Practice 3: **Interpret and Communicate Information from Science, Technology, Engineering, and Mathematics**

STEM proficient students will interpret and communicate information from science, technology, engineering, and mathematics to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

A. Identify, analyze, and evaluate appropriate science, technology, engineering, and mathematics information (text, visual, audio, etc.).

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Listen to text, visual or audio information from *science*, *technology*, *engineering* or *mathematics* content. *(CCSS RI.K.10)* • Participate in conversation with adults and peers. *(CCSS SL.K.1a)* • Ask questions to clarify meaning. *(CCSS SL.K.2; SL.2)* • Recall global issues from text, visual, audio, etc. • Discover real world problems through multiple sources.	• Identify and compile information from appropriate sources (text, visual, audio, etc.) from *science*, *technology*, *engineering*, or *mathematics* to aide in answering complex questions, investigating global issues, solving real world problems or challenges. *(CCSS RI.2.7)* • Compare and contrast information gathered from multiple sources when, investigating global issues, real world problems or challenges. *(CCSS RI.2.9)*	• Read, listen or view (text, visual, audio, etc) information related to *science*, *technology*, *engineering*, and *mathematics* to answer complex questions, investigate global issues, or solve real world problems, or challenges. *(CCSS RI.5.7)* • Analyze multiple sources of information to understand complex questions, investigate global issues, real world problems or challenges. *(CCSS RI. 5.6)*

STEM Standard of Practice 3: **Interpret and Communicate Information from Science, Technology, Engineering, and Mathematics**

STEM proficient students will interpret and communicate information from science, technology, engineering, and mathematics to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

B. Apply appropriate domain specific vocabulary when responding and discussing science, technology, engineering, and mathematics content.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• With modeling and support, answer questions about unknown words in text. *(CCSS RI.K.4)* • With modeling and support, activate prior knowledge and experiences to determine the meaning of unknown words. *(CCSS RI.K.4)* • With modeling and support, use text, illustrations, graphics aides (e.g. print features, size of print, illustrations/photographs, drawings, maps, graphs and diagrams) to identify meaning of unknown words. *(CCSS RI.K.4; See MTLSS K.4.B.1a)* • Draw or write symbols or words used in *science*, *technology*, *engineering* or *mathematics*.	• Access prior knowledge and experiences to determine and clarify meaning of words and phrases in a text. *(CCSS RI.2.4)* • Comprehend symbols and words used in *science*, *technology*, *engineering* and *mathematics*. *(See MTLSS 1&2.4.B.1a)* • Determine the meaning of words, phrases, and or symbols in text relevant to grade 2 topics or subject areas. *(CCSS RI. 2.4; SC, 2)* • Use text features to clarify meaning of words and phrases and enhance comprehension of in informational text. *(CCSS RI.2.4)*	• Determine the meaning of general academic and domain-specific vocabulary or phrases in text relevant to grade 5 topic or subject area. *(CCSS RI. 5.4; SC, 5)* • Determine the meaning of symbols, words or key terms used in *science*, *technology*, *engineering*, and *mathematics*. *(See MTLSS 3,4&5.4.B.1a)* • Apply appropriate academic and domain-specific vocabulary when responding either orally or in writing to text-specific questions. *(CCSS RI. 5. 1)* • Use academic and domain-specific vocabulary when explaining either orally or in writing the organizational structure of a text or print of a text. *(CCSS RI.5. 5; See CCSS W.4. 9; L6)* • Apply academic and domain-specific vocabulary when writing about or discussing informational texts. *(CCSS RI. 5.2; See CCSS W.5.9; L9)* • Apply academic and domain-specific vocabulary to discuss and/or write any types of relations. *(CCSS RI.5. 3; See CCSS LS. 5. 6)*

STEM Standard of Practice 3: **Interpret and Communicate Information from Science, Technology, Engineering, and Mathematics**

STEM proficient students will interpret and communicate information from science, technology, engineering, and mathematics to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

C. Engage in critical reading and writing of technical information.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:

• Develop awareness of strategies that are used to monitor understanding before, during, and after reading, viewing, or listening to informational text. *(CCSS RI.PK.1)*
• Listen to a wide variety of complex texts, (e.g. grade/age appropriate *science*, *technology*, *engineering*, or *mathematics* texts). *(CCSS RI.K.2;MS SLM K.6.A.1a)*
• Recognize that thoughts and ideas can be represented in drawing and writing. *(CCSS K. W1;See MTLSS K.4.B.1a)*
• Generate ideas by using letter-like shapes, symbols, and letters, dictating words and phrases, and using drawings to represent ideas. *(CCSS K. W1)*
	• Engage in critical reading of informational texts by, *(CCSS RI.2.5)*
	  • Pre-reading/engaging with text.
	  • Reading words and symbols from informational text to examine meaning.
	  • Rereading to identify central ideas and key supporting details.
	  • Comprehending informational text.
	  • Summarizing informational text. *(CCSS RI. 2.2; SC, 2;See MTLSS 1&2.4.A.1a-c;MS SLM 2-3.6.1a)*
	• Engage in writing informational texts by,
	  • Understanding the difference between narrative and technical writing.
	  • Writing informative/expository texts to answer complex questions, respond to global issues, or to solve real world problems or challenges. *(CCSS RI.2.5; W2;See MS SLM 2-3.6.A.1d)*
		• Apply appropriate strategies before reading, viewing, or listening to text. *(CCSS RI. 5.1)*
		• Analyze words and symbols from informational text to examine meaning.
		• Summarize an informational text, either orally or in writing, including the main ideas and significant supporting information from across the text. *(CCSS RI. 5.2;See CCSS RL.4.2; W9; SL.4.6;See MS SLM 4-5.6.A.1bi)*
		• Draft introduction that addresses audience needs and the writing purpose. *(CCSS W.5.1.a; MTLSS 3, 4&5. 4.A.1c)*
		• Create models, graphics and drawings to communicate relevant textual evidence. *(CCSS RI. 5.7;MTLSS 3,4&5.4.D.1b)*

STEM Standard of Practice 3: **Interpret and Communicate Information from Science, Technology, Engineering, and Mathematics**

STEM proficient students will interpret and communicate information from science, technology, engineering, and mathematics to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

D. Evaluate and integrate multiple sources of information (e.g.: quantitative data, video, and multimedia) presented in diverse formats.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Name one or more sources of information from *science*, *technology*, *engineering*, or *mathematics*. • List different sources of information. • Match pictures to words using multiple sources of information. *(CCSS RI.K.7; MD MS SLM K:1 2B1.d)* • Use texts or sources to encourage students to ask and answer questions, explore global issues or solve real world problems or challenges. *(See MTLSS K.4.C.1a)*	• Identify and locate numerous information sources to answer complex questions, investigate global issues, and solve real world problems or challenges. *(CCSS RI.2.5)* • Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently. *(CCSS RI.2.5)* • Organize information from multiple texts or sources to answer complex questions, investigate global issues, or solve real world problems or challenges. *(See MTLSS 1 &2.4.C.1a)*	• Sources of information from *science*, *technology*, and *mathematics* to address questions, investigate global issues or solve real world problems or challenges. • Analyze multiple sources for accuracy and relevancy. • Compare and contrast the overall structure (e.g. chronology, comparison, cause/effect, and problem/solution) of events, ideas, concepts, or information in two or more texts. *(CCSS RI.5.5)* • Analyze information from multiple texts or sources to answer complex questions, investigate global issues, and solve real world problems or challenges. *(See MTLSS 3,4&5.4.C.1a)*

STEM Standard of Practice 3: **Interpret and Communicate Information from Science, Technology, Engineering, and Mathematics**

STEM proficient students will interpret and communicate information from science, technology, engineering, and mathematics to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

E. Develop an evidence-based opinion or argument.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Participate in a discussion about learning experiences that simulates and guides thinking to express an opinion. *(CCSS W.K.1)* • After discussion, express an opinion by completing a cloze sentence orally, with a drawing, dictation or developmentally appropriate writing. *(CCSS W.K.1)* • Listen to the opinion of others. *(CCSS SL.K.1b)* • After discussion, apply the prewriting and planning stages of the writing process to an opinion. *(CCSS W.K.1)*	• Form an opinion based on prior knowledge and information provided. *(CCSS W.2.1a)* • Differentiate between facts and opinion within a specific source. *(CCSS W. 2.1b)* • Listen and respond appropriately to the opinion of individuals and/or groups. • Draft a concluding statement that restates the opinion. *(CCSS W.2.1d)*	• Apply the prewriting and planning stages of the writing process to include formulating an opinion. *(CCSS W.5. 1a)* • Differentiate facts or reasons from opinion(s) and select facts and/or details that support reasons. *(CCSS W.5.1b)* • Critique the opinions/arguments of individuals and/or group. *(CCSS SL. 5.1b)* • Write a conclusion that paraphrases the opinion or point of view. *(CCSS W.5.1d; CCSS W.3.4.5.6).* • Cite sources to support an evidence-based opinion.

STEM Standard of Practice 3: **Interpret and Communicate Information from Science, Technology, Engineering, and Mathematics**

STEM proficient students will interpret and communicate information from science, technology, engineering, and mathematics to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

F: Communicate effectively and precisely with others.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Connect personal/prior knowledge and experiences. *(CCSS SL.K.4)* • Choose appropriate visuals to match presentations. *(CCSS SL.K.5)* • Use available technology appropriately to display ideas. *(CCSS SL.K.5)* • Ability to formulate questions targeted to specific needs. *(CCSS SL. K.3)* • Speak clearly enough to be heard and understood. *(CCSS SL.K.4)* • Communicate thoughts and ideas. *(See MTLSS K.4.C.1a)*	• Distinguish between relevant and irrelevant details. *(CCSS SL.2.4)* • Use a variety of formats to prepare the finding/conclusions of an information need for sharing. *(CCSS SL.2.5)* • Use technology to record and organize data/information. *(CCSS SL.2.5)* • Ask and answer questions such as who, what, where, when, why, and how to facilitate understanding of key details *(CCSS SL.2.3; See CCSS RI. 2.2; MD MS SLM 2-3 3B1.a)* • Use appropriate non-verbal techniques to enhance communication, e.g., posture, eye-contact, facial expressions, gestures. *(CCSS.SL.2.4)* • Communicate understanding of information to others. *(See MTLSS 1&2.4.C.1a)*	• Select print, online, and multimedia sources with appropriate facts and relevant descriptive details about topic. *(CCSS SL.5.4)* • Share information in an appropriate format for written, oral, sound, and/or visual presentation *(CCSS SL.5.5)* • Differentiate media types for audience, environment, and purpose of presentation. *(CCSS SL.5.5)* • Take notes and record information in a variety of formats as needed, including technology. *(CCSS SL.5. 3)* • Use appropriate non-verbal techniques to enhance communication, e.g., posture, eye-contact, facial expressions, gestures. *(CCSS SL.5.4)* • Communicate thoughts and ideas through a variety of forms, e.g. written, visual or auditory. *(See MTLSS 3,4&5.4.C.1a)*

Comment [SJ1]: What does this mean?

STEM Standard of Practice 4: **Engage in Inquiry**

STEM proficient students will engage in inquiry to investigate global issues, challenges, and real world problems.

A. Ask questions to identify and define global issues, challenges and real world real world problems.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:;	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:;	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Ask and answer questions: a. about content specific books. b. related to global issues c. to solve real world problems or challenges. *(MS SLM Pk-1. 6.A.1d)* • Pose/ask questions about the problem/situation. *(SS.K.6.C.2.b)* • Ask and/or answer who, what, where, how, when and why questions. *(CCSS RI.K.1)* • Make predictions based on personal interest, interests of others, or issues or problems around them. • Ask questions to make sense of an issues or problem. • Ask or change a question to address issues or to solve problems.	• Ask multiple questions to identify and define: a. global issues. b. real world problems or challenges. *(MS SLM 2-3. 6.A.1d)* • Pose/ask questions about the problem/situation *(SS.2.6.C.2.b)* using question words (e.g. who, what, where, how, when and why) *(CCSS RI.2.1)* • Identify what did not make sense. *(CCSS RI.2.1)* • Make predictions or ask questions. *(CCSS RI. 2.1)* • Ask additional or clarifying questions when relevant and appropriate to further investigate global issues or to solve real world problems or challenges.	• Ask complex questions related to: a. *science*, *technology*, *engineering*, and *mathematics*. b. investigating global issues, solving real world problems or challenges. *(MS SLM 4-5. 6.A.1d)* • Pose questions that elicit higher order thinking responses. *(SS.5.6.C.2.d)* • Use prior knowledge to individually formulate and refine questions to meet an informational needed. *(MS SLM 4:51.B.3.b)* • Create research questions about global issues, social problems or challenges that are grade level appropriate and based on student or class interest. • Use background information to refine researchable questions. *(MS SLM 4:5.3.A.1.a)* • Refine questions to investigate global issues or to solve real world problems or challenges. • Develop a plan for how the answer complex questions about real world problems or situations. *(SS.5.6.C.2.f.)*

STEM Standard of Practice 4: **Engage in Inquiry**

STEM proficient students will engage in inquiry to investigate global issues, challenges, and real world problems.

B. Conduct research to refine questions and develop new questions.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** With some adult assistance, students will be able to:	**Essential Skills and Knowledge** With some adult assistance, students will be able to;
• With modeling and support, a. listen to information related to *science*, *technology*, *engineering*, or *mathematics*. b. discuss topic related to student, school or community interests, issues, or problems. c. ask and answer questions to better understand the questions, problems, or issues. *(See MS SLM Pk-1. 6.A.1a-e)* • Explore books that have information about *science*, *technology*, *engineering*, and *mathematics*. *(MS SLM Pk-1. 1.B.1a)* • Learn how to change individual or group questions and create new questions.	• Identify and gather appropriate information from *science*, *technology*, *engineering*, and *mathematics* content to investigate global issues, real world problems, or challenges. • Begin to apply note-taking strategies when searching information related to STEM. (*See MS SLM 2-3. A.2c;B.1b)* • Critically review information to better understand complex questions, real world problems, or global issues. *(MS SLM 2-3.4.2.2f)* • Ask complex questions related to: a. *science*, *technology*, *engineering*, and *mathematics*. b. investigating global issues, solving real world problems, or challenges. *(MS SLM 2-3. 6.A.1d)* • Create new questions using information from *science*, *technology*, *engineering*, and *mathematics* content, to further investigate global issues, real world problems, or challenges. *(MS SLM 2-3.1.A.1b)*	• Identify evidence needed to solve real world problems, or challenges. • Collect information that may affect the understanding of complex questions, real world problems, or global issues. • Use keywords and text features to find information within a specific source. *(MS SLM 4-5 3.A.1.a)* • Develop new questions using information from *science*, *technology*, *engineering*, and *mathematic*s content. *(MS SLM 4-5.1.A.1c)* • Reflect on and refine research questions, theses, hypotheses, or positions based on new information discovered in the inquiry process. *(MS SLM 6:8 3.C.3.a;MS SLM 4-5.5.B.1c-d)* • Refine questions based on information/evidence found by individual and/or group researched. *(MS SLM 4-5.1.B.3b)* • Apply safe practices for both assignment-related and personal online searches. *(MS SLM 4-5 2.A.2.b)*

STEM Standard of Practice 5: **Engage in Logical Reasoning**

STEM proficient students will engage in logical reasoning to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

A. Engage in critical thinking.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:;
• Utilize the five senses; look, feel, taste, hear, and smell, while engaged in thinking about *science*, *technology*, *engineering*, and *mathematics* related topics. • Engage in conversation with peers and adults using appropriate vocabulary and symbols in sentences. • Verbally describe an object based on its physical characteristics. • Draw and write words or symbols to communicate his/her thoughts, ideas or knowledge. • Repeat one's own thoughts and the thoughts of others.	• Determine what information is important/relevant when asking and answering complex questions. • Make connections and explain relationships among the questions, global issues and real world problems. • Reflect on one's own thoughts while engaged in decision-making, investigation, and/or problem-solving (e.g. what do I already know about this topic, or KWL strategy). • Recognize and reflect upon the thoughts of others while engaged in decision-making, investigation, or problem-solving.	• Construct answers to complex questions while investigating global issues, and developing solutions to real world problems or challenges. • Analyze the relationships and connections between the question and global issues, real world problems or challenges. • Create a plan or strategy for answering complex questions, solving global issues, and/or addressing real world problems. • Demonstrate an ability to reflect on one's own thoughts and the thoughts of others. • Evaluate one's own reflection and the reflections of others while engaged in decision-making, investigation, or problem-solving.

STEM Standard of Practice 5: **Engage in Logical Reasoning**

STEM proficient students will engage in logical reasoning to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

B. Evaluate, select, and apply appropriate systematic approaches (scientific investigations, engineering design processes, and science practices and Standards for Mathematical Practices).

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Begin to apply step by step strategies for practicing what is learned in *science*, *technology*, *engineering*, and *mathematics*. • Begin asking questions, exploring global issues or solving real world problems. • Find information to answer questions or solve real world problems. • Refine steps to see a different answer or solution. • Draw or write a picture of one's mental image of the steps when investigating global issues or solving real world problems or challenges. • Recall previous steps. • Recognize ideas can be repeated. • Begin to use *science practices* and *Standards for Mathematical Practices* to solve real world problems or challenges.	• Identify grade appropriate systematic approaches that can be used to ask complex questions, investigate global issues, and solve real world problems or challenges. • Compare systematic approaches to select the best approach to solving real world problems or challenges (e.g. Engineering Design Process, Scientific Process). • Evaluate systematic approaches that can be used to explore questions, global issues or real world problems. • Apply a systematic approach to answer complex questions, investigate global issues or solve real world problems. • Evaluate the appropriateness and effectiveness of the selected systematic approaches and continue, modify, or replace the systematic approach.	• Select the grade appropriate systematic approach: scientific or engineering design process etc. to investigate global issues or solve real world problems or challenges. • Determine whether systematic approaches can be applied to multiple disciplines. • Evaluate systematic approaches that can be used to explore questions, global issues, or real world problems. • Monitor the progress toward answering questions, investigating global issues or solving real world problems or challenges. • Analyze and interpret data accurately and appropriately *(See MS SLM 4-5. 4. 2b).* • Evaluate and explain why some information may not be found or known. • Apply and evaluate systematic approaches when designing new or yet to be invented models, and to solve current or future real world problems. • Apply *science practices and Standards for Mathematical Practices* to answer complex questions, investigate global issues, and solve real world problems or challenges related to STEM.

STEM Standard of Practice 5: **Engage in Logical Reasoning**

STEM proficient students will engage in logical reasoning to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

C. Apply science, technology, engineering, and mathematics content to construct creative and innovative ideas.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Explore products/models that use *science*, *technology*, *engineering*, and *mathematics*. • Identify products/models. • Manipulate materials to create new ideas. • Build simple model. • Use a mixture of tools to solve real world problems and meet challenges. • Explain their model to others.	• Ask and answer questions through gathering and synthesizing information to construct new ideas. • Ask questions to explore possible solutions to real world problems. • Engage in projects to create products/models/prototypes that use the knowledge of *science*, *technology*, *engineering,* and *mathematics* content. • Identify creative tools, products and current processes used today, or that may be invented in the future to solve real world problems and/or improve processes or systems. • Develop solutions through creating products/models/prototypes for challenges and real world problems. • Present finished products/models/prototypes through public speaking, displays or exhibits.	• Create or improve upon innovative ideas or existing products that use the knowledge of *science*, *technology*, *engineering*, and *mathematics* content. • Ask and answer complex questions to construct creative and innovative ideas. • Imagine and brainstorm ways to find possible solutions to current real world problems or challenges. • Design models that show innovation and creativity. • Present finished models or future plans for designing and building creative and innovative models in a public speak, display or exhibit.

STEM Standard of Practice 5: **Engage in Logical Reasoning**

STEM proficient students will engage in logical reasoning to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

D. Analyze the impact of global issues and real world problems at the local, national, and international levels.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Identify home, school neighborhood and community through pictures and words. • Identify and describe how a globe and maps can be used to help people locate places. *(SS.K.3.A.1)* • Brainstorm real world problems that occur in the home, school, neighborhood or community. • Understand the past and present when exploring global issues or real world problems. • Discuss historical or current issues and topics using *science*, *technology*, *engineering*, and *mathematics* content that are relevant to student's or other's home, school, neighborhood, or community.	• Identify age appropriate global issues that may impact local/national/global decisions. • Use geographic tools to locate and describe places on Earth. *(SS.2.3.A.1)* • Generate questions that could be asked about the local/national/global issues identified. • Gather information, including data from a variety of print, digital and multimedia resources, to build background knowledge/awareness and answer complex questions about the local/national/global issues identified. • Describe, in detail, and explain global issues past and present. • Describe historical or current events that include *science*, *technology*, *engineering* and *mathematics* content that may have had an impact on changing or making better human life locally or nationally.	• Demonstrate an understanding of how history changes human life where you live and around the world. • Use geographic tools to locate places and describe human and physical characteristics… *(SS.5.3.A.1)* • Compare and contrast *science*, *technology*, and *engineering* used past and present. • Research the history or origin of a global issues, real world problems, or challenges. • Gather information, including data from a variety of print, digital and multimedia resources, to build background knowledge/awareness, and to answer complex questions about the global issues identified. • Analyze historical or current events that include *science*, *technology*, *engineering*, and *mathematics* content and that may have had an impact on changing or making better the life of people, animals, environment … locally, nationally, and internationally.

STEM Standard of Practice 6: **Collaborate as a STEM team**

STEM proficient students will collaborate as a STEM team to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

A. Identify, analyze, and perform a science, technology, engineering, and mathematics specific subject matter experts role.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Identify a scientist, technologist, technician, engineer, and mathematician. • Recognize workers as human resources. *(SS. K.4.A.2.a)* • Explore different STEM specific subject matter experts' roles. • Ask questions to learn what a scientist, technologist, technician, engineer, and mathematician does. • Role play what a scientist, technologist, technician, engineer, and mathematician do in the work place. • Work cooperatively with others when asking and answering questions, investigating global issues, or solving real world problems, or challenges.	• Identify a STEM team's goal before engaging in STEM activities. • Identify examples of specialized jobs in local/national/global settings (e.g. nurses, truck drivers, lawyers, and postal workers). *(SS 2.4.A.2.b)* • Identify science, technology, engineering, and mathematics specific subject matter expert(s) and the knowledge they have that makes them experts in their given area. • Determine which STEM professional each team member will play. • Begin to apply knowledge from *science*, *technology*, *engineering*, and *mathematics* when performing SME roles. • Role-play a scientist, technologist, technician, engineer, and mathematician while engaged in STEM activities/tasks such as working to solve real world problems. • Demonstrate the willingness and positive behaviors to cooperate and collaborate with others.	• Analyze and apply knowledge using *science*, *technology*, *engineering*, and *mathematics* content while engaged in a specific subject matter expert role(s). • Describe how available resources affect specialization and trade. *(SS.5.4.A.2.b).* • Identify and analyze the different STEM professions. • Identify and employ themselves or others as subject matter experts. • Employ the willingness and positive behaviors to cooperate and collaborate with others. • Perform multiple duties of the subject matter expert within a group or team to complete a task(s). • Determine the STEM team's goal before engaging in STEM activities.

STEM Standard of Practice 6: **Collaborate as a STEM team**

STEM proficient students will collaborate as a STEM team to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

B. Share ideas and work effectively with a STEM focused multidisciplinary team to achieve a common goal.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:

• Identify the importance of rules. *(SS.K.1.A.1)*
• Understand the rules and expectations of working in a group or team.
• Share ideas and work with others in a timely manner to complete a common task or goal.
• Identify a STEM role, such as time keeper.
• Perform a STEM role.
	• Explain how rules promote orderliness, fairness, responsibility, privacy, and safety. *(SS.2.1.A.1.b)*
	• Collaboratively generate ideas to achieve a common goal by:
	  • Brainstorming ideas.
	  • Asking questions and listening to questions from others.
	  • Sharing ideas with others.
	  • Receiving ideas and suggestions of others.
	• Develop a plan of action in order to achieve a common goal by:
	  • Working cooperatively with others.
	  • Identifying a goal.
	  • Designing a plan /selecting a systematic approach to use to meet set goal.
	  • Implementing the plan/systematic approach to meet set goal
	  • Sharing plans/approaches and finished products/models/prototypes with others.
		• Explain the role of individuals and groups in creating rules and laws to maintain order, protect citizens, and provide services. *(SS.3.1.A.1)*
		• Develop and follow group rules and procedures.
		• Develop personal and group performance goals and expectations before and during STEM activities.
		• Determine the team's focus to represent a multidisciplinary team.
		• Comprehend and apply information from others within a STEM focus and multidisciplinary team to achieve a common goal.
		• Demonstrate perseverance while working with others a STEM focus and multidisciplinary team to complete a task or common goal.
		• Develop a plan of action to achieve a common goal. Assess individual or team's progress on meeting the goal of STEM activities.

STEM Standard of Practice 6: **Collaborate as a STEM team**

STEM proficient students will collaborate as a STEM team to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

C. Listen and be receptive to ideas of others.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:;
• Listen and respond appropriately to ideas of others and use other's ideas as appropriate when completing a team task. • Listen to questions and ideas of others in a team. • Respond to others ideas and questions. • Take turns when others are speaking. • Share ideas with others. • Respect the ideas of others. • Identify, discuss, and demonstrate appropriate social skills, such as listening to the speaker, taking turns, settling and taking turns that help people live, work and play together at home and in school. *(SS.K.2.C.1.a)*	• Listen to details and ideas generated by the group and respond appropriately to others ideas • Ask questions to understand ideas and thoughts of others. • Identify strategies that promote active listening. • Synthesize information and use others ideas as appropriate when completing a team task. • Identify and demonstrate appropriate social skills necessary for working in a cooperative group, such as sharing concern, care and respect among group members. *(SS.2.2.C.1.a)*	• Listen to and receive the *science*, *technology*, *engineering*, and *mathematics* content knowledge, personal experiences, ideas, and view point/perspectives of others in the team. • Repeat and recall knowledge, experiences, and view point/perspectives of others. • Apply strategies that promote active listening. • Identify the main idea of a group discussion. • Listen and ask questions to get a deeper understanding of key ideas or thoughts of others. • Clarify what others have shared and understand what others have said. • Analyze how conflict affected relationships among individuals and groups, such as early settlers and Native Americans, free, and enslaved people. *(SS.5.2.C.1.a)*

STEM Standard of Practice 6: **Collaborate as a STEM team**

STEM proficient students will collaborate as a STEM team to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

D. Analyze career opportunities that exist in a variety of STEM fields relevant to the STEM focused multidisciplinary team's goal.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5 students should be able to:
• Name a STEM professional. • Identify in picture and word a STEM professional. • Listen to stories or media on STEM professionals. • Make connections to similarities and differences among STEM professionals. • Identify and role play different STEM career professions. • Role play community STEM professionals.	• Identify and list several types of STEM professionals. • Research the many roles STEM professional perform in the work place. • Identify specific behaviors and knowledge needed by many STEM professionals to perform their job(s). • Identify and explain how different STEM professionals perform their roles to work together to solve real world problems.	• Compare and analyze how assorted careers in the STEM fields engage in teams to solve real world problems and explore solutions to challenges. • Demonstrate an understanding of the content knowledge, skills, and behaviors many STEM professions apply when working as a team to achieve common goal. • Research several engineering careers in order to understand the career knowledge and behavioral expectations from a variety of engineering professions. • Evaluate how different STEM professionals work together to solve real world problems. • Perform the role of a STEM professional to accomplish STEM team goals.

STEM Standard of Practice 7: **Apply Technology Strategically**

STEM proficient students will apply technology appropriately to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

A. Identify and understand technologies needed to develop solutions to real world problems or construct answers to complex questions.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** With some support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Explain what technology is. • Begin to be aware of technology and how it affects life. *(SS.K.4.A.3.a)* • Identify different types of technology people use every day. • Sort pictures or objects that represent different types of technology.	• Define and explain the term technology. • Identify examples of technology used by consumers (e.g. automobiles, cameras, telephones, microwaves, televisions, clocks and computers). *(SS.2.4.A.3.a)* • Identify ways people use technology to solve real world problems.	• Demonstrate an understanding of how technology can help improve human life. • Explain how the development of new products and new technology affected the way people lived. *(SS.5.4.A.3.a)* • Research a range of technological tools people use every day. • Ask and answer complex questions about how technology can be used to solve real world problems or challenges. • Identify and explain ways people use technology to solve real world problems or challenges. • Create and write interview questions for professionals in the real world who use technology tools to solve real world problems. • Present information on how technology works in many STEM field.

STEM Standard of Practice 7: **Apply Technology Strategically**

STEM proficient students will apply technology appropriately to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

B. Analyze the limits, risks, and impacts of technology.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** With some adult support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:;
• Define the meaning of the words limits and risks. • Identify there are limits using technology. • Identify when risks happen when using technology. • Recognize when technology doesn't work.	• Identify limits of technology. • Identify factors that impact the use of technology. • Identify risks in using technology. • List and explain the limitations of technology. • Conclude that all technology has positive and negative impacts and explain several.	• Analyze and explain the limits of using technology when searching information, investigating global issues, and solving real world problems or challenges. • Identify and explain the risks in using technology when searching information, investigating global issues, and solving real world problems or challenges. • Evaluate how technology has positively or negatively impacts human life. • Present to a public audience the limitations and risks of using or not using technology.

STEM Standard of Practice 7: **Apply Technology Strategically**

STEM proficient students will apply technology appropriately to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

C. Engage in responsible/ethical use of technology.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5, students should be able to:
• Learn and apply the rules of using technology and sharing technology with others *(See MTLSS K.2.B.1).* • Use gentle and positive behaviors when using technology. • Take turns when using technology. • Apply the appropriate use ~ state and district policy *(See MTLSS K. 2.B.1a)*.	• Know and apply rules when using a variety of technologies *(See MTLSS 1 & 2.2.B.1).* • Apply the appropriate use ~ state and district policy *(See MTLSS 1&2. 2.B.1a)* • Recognize and apply the policy of copyright protection *(See MTLSS 2.2.B.2a; MS SLM 2-3. 5.1f*). • Develop positive social behaviors when using technology. • Apply respectful and responsible behaviors while using technology *(See MS SLM 2-3. 5. A.2b)*. • Identify and apply digital etiquette behaviors *(See MTLSS 2.A.2a*).	• Identify and demonstrate rules and responsibilities when using technology *(See MTLSS 3-5.2.B.1).* • Employ the policy of copyright protection when using information from numerous electronic devices *(See MTLSS 2.2.B.2a; MS SLM 4-5. 5.A.1f).* • Employ responsible and ethical behaviors when searching multiple online and digital resources using various technology tools, and sharing information while using different social medias *(See MTLSS 4. 2.1a; MS SLM 2-3. 5. A.2b)*. • Adhere to the safety guidelines, policies, and intended use of technological tools (e.g. copyright protections, cyber safety and ethics, school and school district technology use policy). *(adapted from MS SLM 4-5 2.A.2.a)* • Practice digital etiquette when sharing findings and conclusions. *(MS SLM 4-5. 5.A.2.b)* • Apply the school and school district use of technology policy. *(See MTLSS 3, 4&5 2.B.1a)*

STEM Standard of Practice 7: **Apply Technology Strategically**

STEM proficient students will apply technology appropriately to answer complex questions, to investigate global issues, and to develop solutions for challenges, and real world problems.

D. Improve or create new technologies that extend human capacity.

Grade: Kindergarten	Grades: First through Second	Grades: Third through Fifth
Essential Skills and Knowledge With prompting and support, students will be able to:	**Essential Skills and Knowledge** By the end of grade 2, students should be able to:	**Essential Skills and Knowledge** By the end of grade 5 students should be able to:
• Distinguish among past, present, and future times. (SS.K.5.A.1) • Understand that technology changes over time. • Identify past and present technology through pictures. *(MTLSS K.4.B.1a)* • Identify time or date using technology. • Understand how timelines show a progression over time. • Draw and write new ideas to better technology. • Draw or build safe simple model using technology or technological tools. • Explain how technology affects the way people live, work, and play. (*(MTLSS K.2.A.1b;* SS.4.K.3) • Begin to be aware of technology and how it affects life. (*(MTLSS K.2.A.1c* ;SS.4.K.3a)	• Identify examples of technology used by consumers (e.g. automobiles, cameras, telephones, microwaves, television, and computers). *(MTLSS 2.4.B.1a;SS.4.2.3a)* • List ways people can use technology to better human life. *(MTLSS 1 & 2. 2.A.1c*) • Describe the relationship among events and technologies in a variety of timelines. *(SS.2.5.A.1.b)* • Examine differences between past and present time technologies. *(MTLSS 2.2.A.1b;SS.2.5.A.1)* • Describe how technology has changed over time. • Explain why technology rapidly changes. • Draw and build a model showing new uses of technology or technological tools. • Examine how technology affects the way people live, work, and play. *((MTLSS 1 & 2. 2.A.1c;SS.4.2.3)*	• Analyze the chronology and significance of key events (related to technology) during the age of European exploration (or today). *(SS.5.5.A.1)* • Demonstrate an understanding of how technology can change. • Create ideas and model products that can improve the life of people and animals *(MTLSS 3, 4&5.2.A.1B)*. • Share creative and innovative ideas and models to a public audience or view for public display *(MTLSS 3, 4&5, 4.A.1b).* • Design and build models using technological tools. • Explain how the development of new products and new technologies affected the way people lived. *(MTLSS 3,4&5.2.A.1c;SS.4.5.3a)*

Appendix A

Abbreviations

Grades K - 5

CCSS W.K:5: Common Core State Standards Writing Grades K-5
CCSS RI.K.5: Common Core State Standards Reading Informational Text Grades K5
CCSS SL.K.5: Common Core State Standards Speaking and Listening Grades K-5
CCSS L.K.5: Common Core State Standards Language Grades K-5
CCSS RL.K:5: Common Core Reading Literature Grades K-5
SS K: 5: Maryland State Curriculum-Social Studies K-5
MS SLM K-5: School Library Media State Curriculum K-5
MTLSSS – Maryland Technology Literacy Standards for Students Grades K-5

Online Maryland State Curriculum-Content Standards

Content	Standards Online Websites
Science and Engineering	**A Framework for K:12 Science Education** http://www.nap.edu/catalog.php?record_id=13165
Technology	**Maryland Technology Literacy Standards for Students K:8** http://marylandpublicschools.org/NR/rdonlyres/CFAE6DE8:94E4:4D72:A1DE:50061B2B2A05/13089/MTLSSSComplete1.pdf
International Technology and Engineering Educator's Association (ITEEA)	**ITEEA** http://www.iteaconnect.org/TAA/PDFs/ListingofSTLContentStandards.pdf **Standards for Technology Literacy: Content for the Study of Technology** http://www.iteaconnect.org/TAA/PDFs/xstnd.pdf
Mathematics	Maryland Common Core State Curriculum Frameworks – Mathematics http://mdk12.org/instruction/curriculum/mathematics/index.html
Reading / English Language Arts	**Maryland Common Core State Curriculum Frameworks – Reading / English Language Arts** http://mdk12.org/instruction/curriculum/reading/index.html
School Library Media State Curriculum	**School Library Media State Curriculum** http://www.marylandpublicschools.org/NR/rdonlyres/EC67FB12-FE6B-464A-A2AD-D0C6307773E3/26323/MS_SLM_SC_Accepted_GRpk8.pdf
Social Studies	**Social Studies** http://mdk12.org/instruction/curriculum/social_studies/index.html
Fine Arts	**Fine Arts** http://www.mfaa.msde.state.md.us/source/MDFA_index.asp

Appendix B

Elementary School STEM Standards of Practice Framework and Instructional Guide Glossary

Academic Vocabulary: Terms necessary for understanding ideas across curricular areas.

Access: A way or means of approach.

Accuracy: Degree of conformity of a measure to a standard value.

Action plan: A series of steps and/or activities that must be successfully completed to achieve a goal.

Active listening: Listening that focuses entirely on what the other person is saying and confirms understanding of both the content of the message and the emotions and feelings underlying the message to ensure that understanding is accurate.

Analogy: A comparison between two things for a purpose of explanation or clarification; see simile, metaphor.

Analysis: Identification and evaluation of data, material, and sources for quality of content, validity, credibility and relevance; student compares and contrasts sources and findings and generates summaries and explanations of source materials.

Analyze: To examine something in great detail in order to understand it better or discover more about it.

Anecdotal record: Significant incidents or specific, observable behaviors can be recorded by teachers in anecdotal records. These records provide cumulative information about students' development in the learning objectives of the language arts as well as their physical and social growth and development. By systematically collecting and analyzing anecdotal comments, teachers can evaluate students' progress and abilities to use language and then plan appropriate instruction.

Anecdotes: Brief interesting or amusing life stories used to make a point.

Applies technology to task: Understands the overall intent and the proper procedures for setting up and operating machines, including computers and their programming systems.

Apply: To bring into action; use; employ.

Argument: A purpose for writing using reasons or evidence to support a claim or opinion.

Brainstorming: A method of shared problem solving in which all members of a group spontaneously and in an unrestrained discussion generate ideas.

Challenges: A problem or concern that should be addressed. A competition.

Close read: Observing facts and details about a text and interpreting those details.

Collaboration: The ability to work effectively with diverse teams; be helpful and make necessary compromises to accomplish a common goal.

Communication: The successful transmission of information through a common system of symbols, signs, behavior, speech, writing, or signals.

Compare and contrast: Organizational structure in which the difference and similarities across or within two texts are highlighted or could demonstrate a preference for one thing over another.

Complex question: An open ended question that promotes higher order thinking skills and requires students to synthesize information from multiple sources to develop answers.

Complex text: A text whose complexity is determined by quantitative, qualitative, and reader task components.

Computer literacy: The terminology and range of skills required to successfully use computers and other devices associated with computers.

Connection: The relationship of something with its context.

Constraint: A limit to the design process. Constraints may be such things as appearance, funding, space, materials, and human capabilities.

Content: The subjects or topics covered in a book or document.

Copyright: The exclusive legal right to reproduce, publish, sell, or distribute the matter and form of something.

Create: To bring something into existence; to use imagination to invent things or produce works of art; to result in something or make something happen.

Creative problem solving: Process to identify problems, generate ideas, and create an action plan to solve the problem.

Creative thinking or ideas: The ability or power used to produce original thoughts and ideas based upon reasoning and judgment.

Critical reading: Means reading with the goal of finding deep understanding of a material, whether it is fiction or nonfiction. It is the act of analyzing and evaluating what you are reading as you progress, or as you reflect back.

Critical thinking: The ability to acquire information, analyze, and evaluate it, and reach a conclusion or answer by using logic and reasoning skills.

Cyber bullying: Harassing or being mean to someone in an online environment.

Cyberethics: Ethics related to computer usage.

Data: Collected information which can be quantitative (numerical) or qualitative (descriptive). Factual information used as a basis for reasoning, discussion, or calculation.

Decision-making: The act of examining several possible behaviors and selecting from**.**

Demonstrate: Explain or describe how something works or how to do something; show or prove something clearly and convincingly.

Design process: A systematic problem-solving strategy, with criteria and constraints, used to develop many possible solutions to solve a problem or satisfy human needs and wants and to winnow (narrow) down the possible solutions to one final choice.

Design: An iterative decision making process that produces plans by which resources are converted to products or systems that meet human wants or needs or to solve problems. To create or construct according to a plan.

Develop: To elaborate or expand in detail.

Digital etiquette: The conventional rules or personal behavior pertaining to courteous online practices. For example, considering sensitivities, multiculturalism, diversity, conventions, and tone.

Discipline: A formal branch of knowledge or teaching (e.g., biology, geography, and engineering) that is systematically investigated, documented, and taught.

Divergent questions: Open ended questions that have more than one correct answer, or more than one correct way to solve them.

Domain specific vocabulary: The terminology of a particular field of knowledge or content.

Educational technology: Using multimedia technologies or audiovisual aids as a tool to enhance the teaching and learning process.

Effectively: In an effective manner; "these are real problems that can be dealt with most effectively by rational discussion.

Engineer: A person who is trained in and uses technological and scientific knowledge to solve practical problems.

Engineering design process: The process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic science and mathematics and engineering sciences are applied to convert resources optimally to meet a stated objective.

Engineering design: The systematic and creative application of scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical structures, machines, processes, and systems.

Engineering: The profession of or work performed by an engineer. Engineering involves the knowledge of the mathematical and natural sciences gained by study, experience, and practices that are applied with judgment and creativity to develop ways to utilize materials and forces of nature for the benefit of mankind.

Environmental print: The identification or recognition of print or non-print in familiar settings.

Essential skills: What students need in order to master a specific STEM Standards of Practice Student proficiency.

Ethics: Moral principles that govern an individual or groups behavior.

Ethics: A set of moral principals or values; A theory or system of moral values (the present-day materialistic ethic); Plural but singular in construction; The principal of conduct governing a individual or group.

Etiquette: The conduct or procedure required by good breeding or prescribed by authority to be observed in social or official life.

Evaluate: To consider or examine something in order to judge its value, quality, importance, extent, or condition.

Evaluation: Judge the product (effectiveness); judge the process (efficiency).

Evidence: Facts, figures, details, quotations, or other sources of data and information that provide support for claims or an analysis that can be evaluated by others; should appear in a form and be derived from a source widely accepted as appropriate to a particular disciplines, as in details or quotations from a text in the study of literature and experimental results in the study of science.

Expository text: The nature of exposition; serving to expound, set forth, or explain.

Facilitate: To help bring about learning or make learning easier.

Figurative language/meaning: A type of language that does not mean explicitly what it says; contains words and phrases that require a reader to make inferences and use his/her imagination in order to create a more vivid image or real experience.

Figures of speech: a non-literal expression in which the meaning is ironic, metaphorical, or rhetorical.

Foundation questions: Questions that are derived from overarching questions. These are the "What is…" questions. Their answers are absolute and are usually singular (only one right answer).

Gather: To learn from information given; conclude or assume.

Global issues: Issues that impact the Earth as a whole, problems that concern a population throughout the world. An global issue is an issue that's going on all over the world meaning it not only going on in a certain place. For example: global warming is a global issue, not like the oil spill it hasn't affected the whole world.

Graphic organizer: Different ways to visually organize information.

Hypothesis: A tentative answer to a question, from which testable prediction can be generated.

I Do, We Do, You Do: An instructional strategy where practice is scaffolded to support the learners needs. The teacher models for students, students work in groups for guided practice and then finally students work.

Identify: To recognize somebody or something and to be able to say who or what he, she, or it is.

Implication: Something suggested as naturally to be inferred or understood.

Independent(ly): A student performance done without scaffolding from a teacher, other adult, or peer.

Inference: A logical guess based on text evidence and the reader's prior knowledge.

Information: Knowledge gained through study, communication, research, instruction, etc.; factual data.

Informational text: Includes literary non-fiction, expository text, technical text, procedural text, and functional text.

Innovation: An improvement of existing technological product, system, or method of doing something.

Innovative: Demonstrating originality and inventiveness in work; developing, implementing and communicating new ideas to others; being open and responsive to new and diverse perspectives.

Inquiry based learning: Learning that can be applied to all disciplines. Individuals need many perspectives for viewing the world. Such views could include artistic, scientific, historic, economic, and other perspectives. While disciplines should interrelate, inquiry learning includes the application of certain specific "ground rules" that insure the integrity of the various disciplines and their world views.

Inquiry: A seeking or request for truth, information, or knowledge – an investigation.

Integrate: Combine knowledge from multiple disciplines.

Interdisciplinary: Across content or discipline areas.

Investigation: An examination or inquiry into something, especially a detailed one that is undertaken officially, or the act of undertaking an examination.

Issue: Point of matter or dispute which is special to public importance.

Language of the discipline: The language professionals in a given field use to communicate with their peers.

Lesson module: A unit of education or instruction with a relatively low student-to-teacher ratio, in which a single topic or a small section of a broad topic is studied for a given period of time.

Lesson: A period of instruction; a class. An assignment or exercise in which something is to be learned. An act or instance of instructing/teaching.

Limit: A boundary.

Listening: To hear something with thoughtful attention, to give consideration.

Local: In close proximity to a given location, community.

Logic: The ability to use reasoning to determine relationships among propositions in terms of implication, contradiction, contrariety, and conversion.

Logical reasoning: How things fit together.

Mathematical practices: Processes and proficiencies as described in a variety of mathematical expertise.

Mathematics: The science of numbers and their operations, interrelations, combinations, generalizations, and abstractions and of space configurations and their structure, measurement, transformations, and generalizations.

Metacognition: Is defined as "cognition about cognition", or "knowing about knowing." It can take many forms; it includes knowledge about when and how to use particular strategies for learning or for problem solving.

Model : A replica of a larger object or product.

Module: A self-constrained unit.

Netiquette: Etiquette governing communication on the Internet.

New: Unfamiliar or novel to the student.

Nonfiction/informational text: The branch of literature comprising works of narrative prose dealing with or offering opinions or conjectures upon facts and reality, including biography, history, and the essay.

Opinion: A view or judgment formed about something.

Overarching Questions: Questions that are not answerable with finality in a brief sentence. Typically, further research is required to answer overarching questions. Their aim is to stimulate thought, to provoke inquiry, and to spark more questions.

Piracy: Stealing computer software.

Plan: A scheme or method of acting, doing, proceeding, making, etc., developed in advance.

Precisely: Used to indicate that something is stated exactly; with absolute accuracy.

Primary source: A first-hand account of an event.

Prior knowledge: Information that a student knows before a lesson/instruction/research/exploration.

Problem solving: The process of understanding a problem, devising a plan, carrying out the plan, and evaluating the plan in order to solve a problem or meet a need or want.

Problem-base learning: (PBL) is a student-centered pedagogy in which students learn about a subject in the context of complex, multifaceted, and realistic problems (not to be confused with project-based learning).

Problems: An issue concerning one or more people.

Proficient: Performance that meets the criterion established in the Standards as measured by a teacher or assessment.

Proficiently: A student performance that meets the criterion established in the Standards as measured by teacher or assessment.

Project based learning: Is a systematic teaching method that engages students in learning important knowledge and 21st century skills through an extended, student-influenced inquiry process structured around complex, authentic questions and carefully designed products and learning tasks.

Prototype: A full-scale working model used to test a design concept by making actual observations and necessary adjustments.

Question: A request for information or for a reply, which usually ends with a question mark if written or on a rising intonation if spoken.

Real world problems: Problems that actually occur in everyday life.

Real world: The realm of practical or actual experience, as opposed to the abstract, theoretical, or idealized sphere of the classroom, laboratory, etc.

References: A spoken or written comment that either specifically mentions or calls attention to somebody or something or is intended to bring somebody or something to mind.

Refine: To clarify, improve, and polish a research question or information need throughout the inquiry process.

Relevant ideas: Any thoughts, conceptions, or notions pertinent to a learning activity.

Relevant information: Knowledge gained through study, communication, research, instruction etc. pertinent to a learning activity.

Research: Identification and utilization of appropriate strategies to explore and answer problems and to conduct research on a range of questions.

Researchable question: A clear and concise question that has a means of which to be answered through investigation.

Risk: A factor, thing, element, or course involving uncertain danger; a hazard.

Role: The actions and activities assigned to or required or expected of a person or group; "the function of a teacher"; "the government must do its part"; "play its role."

Runoff: The portion of precipitation on land that ultimately reaches streams often with dissolved or suspended material.

Science: Knowledge about or study of the natural world based on facts learned through experiments and observations.

Scientific method: A method of research in which a problem is identified, relevant data are gathered, a hypothesis is formulated from these data, and the hypothesis is empirically tested.

Self-directed: Monitoring one's own understanding and learning needs; demonstrating initiative to advance professional skill levels; **defining, prioritizing and completing tasks without direct oversight;** demonstrating commitment to lifelong learning.

Skill: An ability that has been acquired by training or experience.

Solution: The successful action of solving a problem, the answer that fixes the problem.

Source: A work, etc. supplying information or evidence (esp. of an original primary character) as to some fact, event, or series of these. Could also be a person supplying information, an informant, a spokesman.

Strategic reader: A student who naturally internalizes the reading process – before, during and after reading strategies.

Strategies: A plan, method, or series of maneuvers or stratagems for obtaining a specific goal or result.

Subject matter expert: A person who as comprehensive and/or authoritative knowledge or skill in a particular area or topic.

Synthesis: Organize from multiple sources; present the information.

Synthesize: To merge new information with prior knowledge, to form a new idea, perspective, or opinion: to generate insight.

Systematic approach: Repeatable and learnable through a step by step procedure.

Team: Cooperative learning strategies.

Technical audiences: Audience consisting of practitioners in the field of engineering, technology, design, business, and other workforce-related disciplines.

Technical information: Belonging to or involving a specialized subject, field, or profession.

Technical texts: Formula reading relating to or characteristic of a particular field.

Technical writing: Treating a document with the goal of providing clear and concise information, rather than entertainment or story telling; a technical document/report incorporates diagrams and multi-media information to provide technical information.

Technological tool: A device used by humans to complete a task. These tools may include rulers, protractors, computer softwares, CAD programs, etc.

Technology literacy: The ability to use, manage, understand and assess technology.

Technology: Human innovation in action that involves the generation of knowledge and processes to develop systems that solve problems and extend human capabilities.

Test: A method for collecting data; a procedure for critical evaluation.

Tool: Device for precise measurement and/or construction.

Topic: Subject of conversation or discussion.

Transdisciplinary: In the transdisciplinary approach to integration, teachers organize curriculum around student questions and concerns. Students develop life skills as they apply interdisciplinary and disciplinary skills in a real-life context. Two routes lead to transdisciplinary integration: project-based learning and negotiating the curriculum. (Drake & Burns, 2005)

Units: Are a series of lessons that address the same resource or theme.

Utilize: To put to use, especially to find a profitable or practical use for

Weigh: Assess the importance of (a contribution) in making a decision.

Appendix C

References

"School Improvement in Maryland"—Glossary*

English Language Arts http://www.mdk12.org/instruction/curriculum/reading/glossary.shtml

School Library Media http://mdk12.org/instruction/curriculum/library_media/index.html

Social Studies http://mdk12.org/assessments/vsc/social_studies/bygrade/glossary.shtml

Technology Education http://mdk12.org/instruction/curriculum/technology_education/index.html

21st Century Skills http://www.p21.org/

Online References

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- Copyright - Adapted from http://www.copyrightkids.org/
- Creative Problem Solving Process - http://www.creativeeducationfoundation.org/our-process/what-is-cps
- Critical thinking - Adapted from http://dictionary.reference.com/browse/critical+thinking
- Cyberethics - Adapted from https://docs.google.com/viewer?a=v&q=cache:Ks6kijGdLyIJ:iris.nyit.edu/~mtehrani/Week2_assignment1_MTehrani.pdf+&hl=en&gl=us&pid=bl&srcid=ADGEESiedhumnaTwb2KEVqbjj95ITRopzPbbN9pBTYmr7xX10KJxKeV3_xjSSYaB_iNG8vGW1vmVL1bXpxQwTTnQTsnxjSHtMOqeFuqWYwMos0vRmT3MzYNJcV9kbpsUJ80plLrFiCQL&sig=AHIEtbTBP_vhfRFUNC0QY4fltkm3epyCEw&pli=1
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- "Dictionary.com" http://dictionary.reference.com/
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- Etiquette - Adapted from http://www.merriam-webster.com/dictionary/etiquette
- Global Issues -Adapted from http://dictionary.reference.com/browse/issue?s=t
- Hacking - Adapted from http://www.techterms.com/definition/hacker
- Implication - Adapted from http://dictionary.reference.com/browse/implication
- Issue - Adapted from http://dictionary.reference.com/browse/issue?s=t

- Jigsaw/expert group - definition adapted from: A cooperative learning structure where group members become experts in a given topic and teach the other members of the group. http://www.jigsaw.org (please add this link to our resource column) Engineering Design Cycle - (Change to Engineering Design Process and delete Engineering Design Cycle from the Glossary) Design - http://www.merriam-webster.com/ Create - http://www.merriam-webster.com/ Adapts - http://www.merriam-webster.com/ Model - http://www.merriam-webster.com/ Tool - http://www.merriam-webster.com/ Innovation - adapted from Dictionary.com Cooperative learning strategies - (needs definition) Collaboration - http://www.merriam-webster.com/ Team - http://www.merriam-webster.com/ SME - Subject Matter Expert - MSDE Plan - http://www.merriam-webster.com/ SME - Subject Matter Expert - MSDE Listening - http://www.merriam-webster.com/dictionary/listen
- Netiquette - Adapted from http://www.bpl.org/kids/netiquette.htm
- Piracy - Adapted from http://www.techterms.com/definition/piracy
- Project-based learning - Adapted from http://pbl-online.org/About/whatisPBL.htm
- Science -Adapted from http://dictionary.reference.com/browse/science
- Scientific method - Adapted from http://www.me.unlv.edu/Undergraduate/coursenotes/meg497/ABETdefinition.htm
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