STARBASE Minnesota Alignment to MN K-12 Standards in Science and Mathematics

The STARBASE experience supports the following Minnesota science and math standards

Science

	Strand	Substrand	Standard	Number	Benchmark
4	1. The Nature of Science and Engineering	2. The Practice of Engineering	1. Engineers design, create and develop structures, processes and systems that are intended to improve society and may make humans more productive.	4.1.2.1.3	Test and evaluate solutions, considering advantages and disadvantages of the engineering solution, and communicate the results effectively.
4	1. The Nature of Science and Engineering	2. The Practice of Engineering	2. Engineering design is the process of identifying problems, developing multiple solutions, selecting the best possible solution, and building the product.	4.1.2.2.1	Identify and investigate a design solution and describe how it was used to solve an everyday problem.
4	1. The Nature of Science and Engineering	2. The Practice of Engineering	2. Engineering design is the process of identifying problems, developing multiple solutions, selecting the best possible solution, and building the product.	4.1.2.2.2	Generate ideas and possible constraints for solving a problem through engineering design.
4	1. The Nature of Science and Engineering	2. The Practice of Engineering	2. Engineering design is the process of identifying problems, developing multiple solutions, selecting the best possible solution, and building the product.	4.1.2.2.3	Test and evaluate solutions, considering advantages and disadvantages of the engineering solution, and communicate the results effectively.
4	1. The Nature of Science and Engineering	3. Interactions Among Science, Technology Engineering, Mathematics, and	3. The needs of any society influence the technologies that are developed and how they are used.	4.1.3.3.1	Describe a situation in which one invention led to other inventions.

		Society			
4	2. Physical Science	1. Matter	1. Objects have observable properties that can be measured.	4.2.1.1.1	Measure temperature, volume, weight and length using appropriate tools and units.
4	2. Physical Science	2. Energy	1. Energy appears in different forms, including heat and electromagnetism.	4.2.3.1.1	Describe the transfer of heat energy when a warm and a cool object are touching or placed near each other.
4	2. Physical Science	2. Energy	1. Energy appears in different forms, including heat and electromagnetism.	4.2.3.2.1	Compare materials that are conductors and insulators of heat and/or electricity.
5	1. The Nature of Science and Engineering	1. The practice of Science	1. Science is a way of knowing about the natural world, is done by individuals and groups, and is characterized by empirical criteria, logical argument and skeptical review.	5.1.1.1.2	Recognize that when scientific investigations are replicated they generally produce the same results, and when results differ significantly it is important to investigate why may have caused such differences.
5	1. The Nature of Science and Engineering	1. The Practice of Science	1. Science is a way of knowing about the natural world, is done by individuals and groups, and is characterized by empirical criteria, logical argument and skeptical review.	5.1.1.1.4	Understand that different models can be used to represent natural phenomena and these models have limitations about what they can explain.
5	1. The Nature of Science and Engineering	1. The Practice of Science	2. Scientific inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations.	5.1.1.2.1	Generate a scientific question and plan an appropriate scientific investigation, such as systematic observations, field studies, open-ended exploration or controlled experiments to answer the question.
5	1. The Nature of Science and Engineering	1. The Practice of Science	2. Scientific inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations.	5.1.1.2.2	Identify and collect relevant evidence, make systematic observations and accurate measurements, and identify variables in a scientific investigation.

5	1. Nature of Science and Engineering	3. Interactions Among Science, Technology, Engineering, Mathematics and Society	4. Tools and mathematics help scientists and engineers see more, measure more accurately, and do things that they could not otherwise accomplish	5.1.3.4.1	Use appropriate tools and techniques in gathering, analyzing and interpreting data.
5	1. The Nature of Science and Engineering	3. Interactions Among Science, Technology Engineering, Mathematics, and Society	4. Tools and mathematics help scientists and engineers see more, measure more accurately, and do things that they could not otherwise accomplish.	5.1.3.4.2	Create and analyze different kinds of maps of the student's community and of Minnesota. *For example:* Weather maps, city maps, aerial photos, regional maps or online map resources.
5	1. Nature of Science and Engineering	3. Interactions Among Science, Technology Engineering, Mathematics, and Society	4. Tools and mathematics help scientist and engineers see more, measure more accurately, and do things that they could not otherwise accomplish.	5.1.3.4.3.1	Use appropriate tools and techniques in gathering, analyzing and interpreting data.
5	2. Physical Science	2. Motion	1. An object's motion is affected by forces and can be described by the object's speed and the direction it is moving.	5.2.2.1.2	Identify the force that starts something moving or changes its speed or direction of motion.
5	2. Physical Science	2. Motion	1. An object's motion is affected by forces and can be described by the object's speed and the direction it is moving.	5.2.2.1.3	Demonstrate that a greater force on an object can produce a greater change in motion.
5	3. Earth and Space Science	4. Human Interactions with Earth Systems	1. In order to maintain and improve their existence, humans interact with and influence Earth systems.	5.3.4.1.1	Identify renewable and non-renewable energy and material resources that are found in Minnesota and describe how they are used.
6	1. The Nature of Science and Engineering	2. The Practice of Engineering	1. Engineers create, develop and manufacture machines, structures, processes and systems that impact society	6.1.2.1.1	Identify a common engineered system and evaluate its impact on the daily life of humans.

			and may make humans more productive.		
6	1. The Nature of Science and Engineering	2. The Practice of Engineering	1. Engineers create, develop and manufacture machines, structures, processes and systems that impact society and may make humans more productive.	6.1.2.1.2	Recognize that there is no perfect design and that new technologies have consequences that may increase some risks and decrease others. For example: Seat belts and air bags.
6	1. The Nature of Science and Engineering	2. The Practice of Engineering	1. Engineers create, develop and manufacture machines, structures, processes and systems that impact society and may make humans more productive.	6.1.2.1.4	Explain the importance of learning from past failures, in order to inform future designs of similar products or systems. *For example:* Space shuttle or bridge design.
6	1. The Nature of Science and Engineering	2. The Practice of Engineering	2. Engineering design is the process of devising products, processes and systems that address a need, capitalize on an opportunity, or solve a specific problem.	6.1.2.2.1	Apply and document an engineering design process that includes identifying criteria and constraints, making representations, testing and evaluation, and refining the design as needed to construct a product or system that solves a problem. *For example:* Investigate how energy changes from one form to another by designing and constructing a simple roller coaster for a marble.
6	1. The Nature of Science and Engineering	3. Interactions Among Science, Technology, Engineering, Mathematics, and Society	4. Current and emerging technologies have enabled humans to develop and use models to understand and communicate how natural and designed systems work and interact.	6.1.3.4.1	Determine and use appropriate safe procedures, tools, measurements, graphs and mathematical analyses to describe and investigate natural and designed systems in a physical science context.
6	2. Physical Science	1. Matter	2. Substances can undergo physical changes which do not change the composition or the	6.2.1.2.1	Identify evidence of physical changes, including changing phase or shape, and dissolving in other materials.

			total mass of the substance in a closed system.		
6	2. Physical Science	1. Matter	2. Substances can undergo physical changes which do not change the composition or the total mass of the substance in a closed system.	6.2.1.2.3	Use the relationship between heat and the motion and arrangement of particles in solids, liquids and gases to explain melting, freezing, condensation and evaporation.
6	2. Physical Science	2. Motion	1. The motion of an object can be described in terms of speed, direction and change of position.	6.2.2.1.1	Measure and calculate the speed of an object that is traveling in a straight line.
6	2. Physical Science	2. Motion	1. The motion of an object can be described in terms of speed, direction and change of position.	6.2.2.1.2	For an object traveling in a straight line, graph the object's position as a function of time and its speed as a function of time. Explain how these graphs describe the object's motion.
6	2. Physical Science	2. Motion	2. Forces have magnitude and direction and affect the motion of objects.	6.2.2.2.1	Recognize that when the forces acting on an object are balanced, the object remains at rest or continues to move at a constant speed in a straight line, and that unbalanced forces cause a change in the speed or direction of the motion of an object.
6	2. Physical Science	3. Energy	2. Energy can be transformed within a system or transferred to other systems or the environment.	6.2.3.2.2	Trace the changes of energy forms, including thermal, electrical, chemical, mechanical or others as energy is used in devices.

Math

		Strand	Standard	Number	Benchmark
4		Geometry & Measurement	Understand angle and area as measurable attributes of real-world and mathematical objects. Use various tools to measure angles and areas.	4.3.2.3	Understand that the area of a two-dimensional figure can be found by counting the total number of same size square units that cover a shape without gaps or overlaps. Justify why length and width are multiplied to find the area of a rectangle by breaking the rectangle into one unit by one unit squares and viewing these as grouped into rows and columns. For example: How many copies of a square sheet of paper are needed to cover the classroom door? Measure the length and width of the door to the nearest inch and compute the area of the door.
4		Geometry & Measurement	Understand angle and area as measurable attributes of real-world and mathematical objects. Use various tools to measure angles and areas.	4.3.2.4	Find the areas of geometric figures and real-world objects that can be divided into rectangular shapes. Use square units to label area measurements.
4		Data Analysis	Collect, organize, display and interpret data, including data collected over a period of time and data represented by fractions and decimals.	4.4.1.1	Use tables, bar graphs, timelines and Venn diagrams to display data sets. The data may include fractions or decimals. Understand that spreadsheet tables and graphs can be used to display data.
5		Number & Operation	Divide multi-digit numbers; solve real-world and mathematical problems using arithmetic.	5.1.1.4	Solve real-world and mathematical problems requiring addition, subtraction, multiplication and division of multidigit whole numbers. Use various strategies, including the inverse relationships between operations, the use of technology, and the context of the problem to assess the reasonableness of results.
5		Number & Operation	Read, write, represent and compare fractions and decimals; recognize and write equivalent fractions; convert between fractions and decimals; use fractions and decimals in real-world and mathematical situations.	5.1.2.1	Read and write decimals using place value to describe decimals in terms of groups from millionths to millions.

5	Number & Operation	Read, write, represent and compare fractions and decimals; recognize and write equivalent fractions; convert between fractions and decimals; use fractions and decimals in real-world and mathematical situations.	5.1.2.3	Order fractions and decimals, including mixed numbers and improper fractions, and locate on a number line.
5	Number & Operation	Add and subtract fractions, mixed numbers and decimals to solve real-world and mathematical problems.	5.1.3.1	Add and subtract decimals and fractions, using efficient and generalizable procedures, including standard algorithms.
5	Number & Operation	Add and subtract fractions, mixed numbers and decimals to solve real-world and mathematical problems.	5.1.3.4	Solve real-world and mathematical problems requiring addition and subtraction of decimals, fractions and mixed numbers, including those involving measurement, geometry and data.
5	Algebra	Recognize and represent patterns of change; use patterns, tables, graphs and rules to solve real-world and mathematical problems.	5.2.1.1	Create and use rules, tables, spreadsheets and graphs to describe patterns of change and solve problems.
5	Algebra	Recognize and represent patterns of change: use patterns, tables, graphs and rules to solve real-world and mathematical problems.	5.2.1.2	Use a rule or table to represent ordered pairs of positive integers and graph these ordered pairs on a coordinate system.
5	Geometry and Measurement	Add and subtract fractions, mixed numbers and decimals to solve real-world and mathematical problems.	5.3.1.1	Describe and classify three-dimensional figures including cubes, prisms and pyramids by the number of edges, faces or vertices as well as the types of faces.
5	Data Analysis	Display and interpret data; determine mean, median and range.	5.4.1.1	Know and use the definitions of the mean, median and range of a set of data. Know how to use a spreadsheet to find the mean, median and range of a data set. Understand that the mean is a "leveling out" of data.
5	Data Analysis	Display and interpret data; determine mean, median and range.	5.4.1.2	Create and analyze double-bar graphs and line graphs by applying understanding of whole numbers, fractions and decimals. Know how to create spreadsheet tables and graphs to display data.
6	Geometry and Measurement	Calculate perimeter, area, surface area and volume of two and three-dimensional figures to solve real-world and mathematical problems.	6.3.1.3	Estimate the perimeter and area of irregular figures on a grid when they cannot be decomposed into common figures and use correct units, such as cm and cm^2.