Meeting MASSACHUSETTS State Science Standards with eCYBERMISSION

The eCYBERMISSION program gives students the chance to explore how science, technology, engineering, and mathematics work in their world. This emphasis on STEM and a chance for students to engage in inquiry practices makes eCYBERMISSION an excellent addition to your classroom. Below you can find the Massachusetts state science standards that align with eCYBERMISSION. Also, based on the direction you give your students their specific investigations can meet content standards (not listed here).

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Some examples of specific skills students should develop in these grades (6-8):

1. Define criteria and constraints of a design problem with precision.
2. Develop a model to describe cycling of matter in an ecosystem; develop a model that describes and predicts changes in particle motion and spatial arrangement during phase changes; develop and/or revise a model to show the relationships among variables, including those that are not observable but predict observable phenomena.
3. Conduct an investigation to show relationships among energy transfer, type of matter, and kinetic energy of particles; conduct an experiment to show that many materials are mixtures.
4. Examine and interpret data to describe the role human activities have played in the rise of global temperatures over time; construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships; distinguish between causal and correlational relationships in data; consider limitations of data analysis.
5. Describe, including through probability statements and proportional reasoning, the process of natural selection; use data and graphs to describe relationships among kinetic energy, mass, and speed of an object.
6. Construct an explanation using evidence for how Earth’s surface has changed over time; apply scientific reasoning to show why the data or evidence is adequate for the explanation.
7. Construct an argument based on evidence for how environmental and genetic factors influence organism growth; respectfully provide and receive critiques about one’s arguments, procedures, and models by citing relevant evidence with pertinent detail.
8. Synthesize and communicate information about artificial selection; obtain and communicate information on how past geologic events are analyzed to make future predictions.

Grade 6: Technology/Engineering

ETS1. Engineering Design

6.MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. Include potential impacts on people and the natural environment that may limit possible solutions.*

6.MS-ETS1-5(MA). Create visual representations of solutions to a design problem. Accurately interpret and apply scale and proportion to visual representations.*

Clarification Statements:

- Examples of visual representations can include sketches, scaled drawings, and orthographic projections.
- Examples of scale can include ¼″ = 1′0″ and 1 cm = 1 m.

6.MS-ETS1-6(MA). Communicate a design solution to an intended user, including design features and limitations of the solution.

Clarification Statement:

Examples of intended users can include students, parents, teachers, manufacturing personnel, engineers, and customers.

Grade 7: Technology/Engineering

ETS1. Engineering Design

7.MS-ETS1-2. Evaluate competing solutions to a given design problem using a decision matrix to determine how well each meets the criteria and constraints of the problem. Use a model of each solution to evaluate how variations in one or more design features, including size, shape, weight, or cost, may affect the function or effectiveness of the solution.*

7.MS-ETS1-4. Generate and analyze data from iterative testing and modification of a proposed object, tool, or process to optimize the object, tool, or process for its intended purpose.*

7.MS-ETS1-7(MA). Construct a prototype of a solution to a given design problem.*

By the end of high school, students should have an understanding of and ability to apply each science and engineering practice to understand the world around them. Students should have had many opportunities to immerse themselves in the practices and to explore why they are central to the applications of science and engineering. Some examples of these science and engineering practices include:

1. Define a design problem that involves the development of a process or system with interacting components and criteria and constraints that may include social, technical, and/or environmental considerations.
2. Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems.
3. Plan and conduct an investigation, including deciding on the types, amount, and accuracy of data needed to produce reliable measurements, and consider limitations on the precision of the data.

4. Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific questions and engineering problems, using digital tools when feasible.
5. Use simple limit cases to test mathematical expressions, computer programs, algorithms, or simulations of a process or system to see if a model "makes sense" by comparing the outcomes with what is known about the real world.
6. Apply scientific reasoning, theory, and/or models to link evidence to the claims and assess the extent to which the reasoning and data support the explanation or conclusion.
7. Respectfully provide and/or receive critiques on scientific arguments by probing reasoning and evidence and challenging ideas and conclusions, and determining what additional information is required to solve contradictions.
8. Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media, verifying the data when possible.

While presented as distinct skill sets, the eight practices intentionally overlap and interconnect. Skills like those outlined above should be reflected in curriculum and instruction that engage students in an integrated use of the practices. The introductory courses (grades 9–10) integrate practices into the standards.