PLTW Launch Standards Connection

Stability and Motion: Forces and Interactions

Connections to Standards in PLTW Launch

PLTW curriculum is designed to empower students to thrive in an evolving world. As a part of the design process when developing and updating our curriculum, we focus on connections to a variety of standards. This PLTW Launch module connects to standards in the following:

Next Generation Science Standards

Motion and Stability: Forces and Interactions

3-PS2-2

Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

3-PS2-3

Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.

3-PS2-4

Define a simple design problem that can be solved by applying scientific ideas about magnets.

Engineering Design

3-5-ETS1-1

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2

Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3

Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Science and Engineering Practices: Asking Questions and Defining Problems

Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships.

- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.

- Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.

Science and Engineering Practices: Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

Next Generation Science Standards

Science and Engineering Practices: Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.

Science and Engineering Practices: Analyzing and Interpreting Data

Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

Science and Engineering Practices: Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

Science and Engineering Practices: Engaging in Argument from Evidence

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

Science and Engineering Practices: Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.

Disciplinary Core Ideas (3-5)

Engineering, Technology, and Applications of Science

ETS1.A Defining and Delimiting Engineering Problems

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.

ETS1.B Developing Possible Solutions

- Research on a problem should be carried out before beginning to design a solution.

Next Generation Science Standards

ETS1.B Developing Possible Solutions

• At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.

ETS1.B Developing Possible Solutions

• Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.

ETS1.B Developing Possible Solutions

• Testing a solution involves investigating how well it performs under a range of likely conditions.

ETS1.C Optimizing the Design Solution

• Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.

Physical Science

PS2.A Forces and Motion

• Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion.

PS2.A Forces and Motion

• The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it.

PS2.B Types of Interactions

• Objects in contact exert forces on each other.

PS2.B Types of Interactions

• Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.

Crosscutting Concepts (3-5)

Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

• Patterns of change can be used to make predictions.

Next Generation Science Standards

Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

- Cause and effect relationships are routinely identified, tested, and used to explain change.

Connections to Engineering, Technology, and Applications of Science (3-5)

Interdependence of Science, Engineering, and Technology

- Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process.

Connections to the Nature of Science (3-5)

Scientific Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns.

Computer Science Teachers Association K-12 Computer Science

In Spring 2023 PLTW submitted all necessary documentation required by the Computer Science Teachers Association (CSTA) for a crosswalk review of our Launch and Gateway curricula by the CSTA Standards Review Team. While we anticipate approval and validation by CSTA, the review is pending.

Computing Systems

Troubleshooting

1B-CS-03

Determine potential solutions to solve simple hardware and software problems using common troubleshooting strategies.

Networks and the Internet

Cybersecurity

1B-NI-05

Discuss real-world cybersecurity problems and how personal information can be protected.

Common Core State Standards English Language Arts - Third Grade

Reading Informational Text Standards

Key Ideas and Details

CCSS.ELA-LITERACY.RI.3.1

Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

CCSS.ELA-LITERACY.RI.3.3

Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing Standards

Research to Build and Present Knowledge

CCSS.ELA-LITERACY.W.3.7

Conduct short research projects that build knowledge about a topic.

CCSS.ELA-LITERACY.W.3.8

Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

Common Core State Standards Mathematics - Third Grade

Mathematical Practices

CCSS.MATH.PRACTICE.MP1

Make sense of problems and persevere in solving them.

CCSS.MATH.PRACTICE.MP3

Construct viable arguments and critique the reasoning of others.

CCSS.MATH.PRACTICE.MP5

Use appropriate tools strategically.

Common Core State Standards Mathematics - Third Grade

Included in Optional Extensions

Number and Operations in Base Ten

Use place value understanding and properties of operations to perform multi-digit arithmetic.

CCSS.MATH.CONTENT.3.NBT.A.2

Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

Measurement and Data

Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

CCSS.MATH.CONTENT.3.MD.C.5

Recognize area as an attribute of plane figures and understand concepts of area measurement.

CCSS.MATH.CONTENT.3.MD.C.6

Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

CCSS.MATH.CONTENT.3.MD.C.7

Relate area to the operations of multiplication and addition.

Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

CCSS.MATH.CONTENT.3.MD.D.8

Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the sam

Mathematical Practices

CCSS.MATH.PRACTICE.MP2

Reason abstractly and quantitatively.

CCSS.MATH.PRACTICE.MP4

Model with mathematics.

CCSS.MATH.PRACTICE.MP6

Attend to precision.

CCSS.MATH.PRACTICE.MP7

Look for and make use of structure.

Common Core State Standards Mathematics - Third Grade

CCSS.MATH.PRACTICE.MP8

Look for and express regularity in repeated reasoning.

References

Computer Science Teachers Association. (2017). *CSTA K-12 Computer Science Standards, revised 2017*. http://www.csteachers.org/standards

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NGSS Lead States. (2013). *Next Generation Science Standards: For states, by states.* National Academies Press.