One Dimensional Kinematics—Modeling Motion

Grade: 11-12

Physics and Algebra 2

One Dimensional Kinematics—Modeling Motion

Unit Overview

In this unit, Physics students will observe and collect data to represent motion of a motorized cart moving at constant velocity and a tennis ball dropped (constant acceleration). They will represent the motion of the cart and tennis ball graphically, algebraically, numerically, and verbally. These representations will be used to develop understanding of one dimensional kinematics. Algebra 2 students will create equations to model motion (linear and quadratic). They will explore and interpret the key features of quadratic functions and use these key features to describe the relationship between distance, velocity, and acceleration.

Content Area Connections

- Science (Physics)
- Mathematics (Algebra 2)

Alignment to Standards

Specific standards and processes will be outlined in the lesson plan.

Connections

Active Learning Strategies (for Purposeful Reading, Meaningful Writing, and Productive Dialogue)

Specific strategies will be utilized with each lesson within the unit and outlined in the lesson plan.

Computational Thinking

**NOTE: Specific connections to Computational Thinking will be outlined in the Unit/Lesson document(s).*

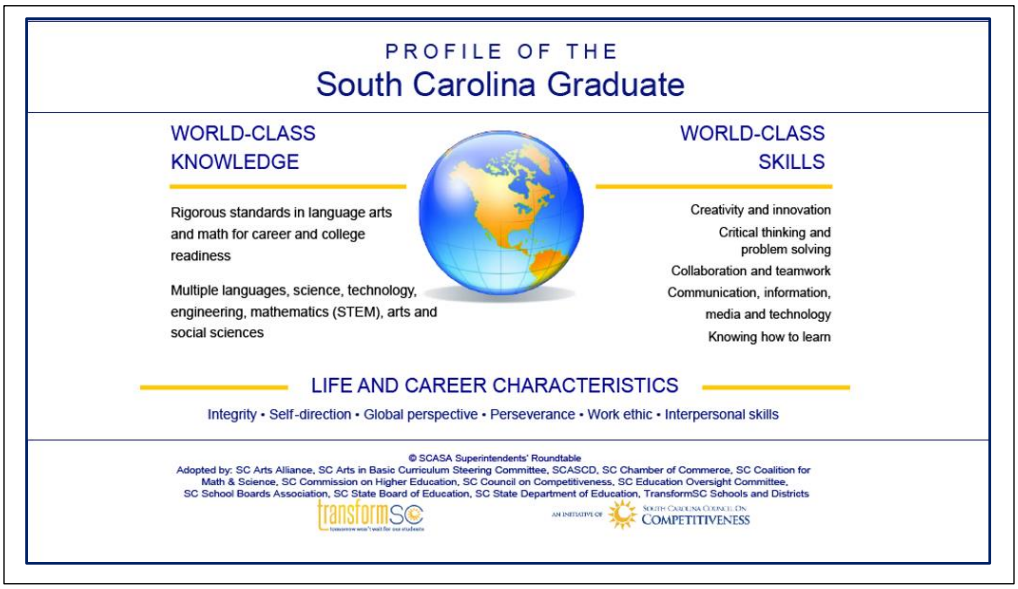
Computational Thinking (CT) is a problem-solving process that includes (but is not limited to) the following ***characteristics****:*

- Formulating problems in a way that enables us to use a computer and other tools to help solve them.
- Logically organizing and analyzing data
- Representing data through abstractions such as models and simulations
- Automating solutions through algorithmic thinking (a series of ordered steps)
- Identifying, analyzing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of steps and resources
- Generalizing and transferring this problem solving process to a wide variety of problems

These skills are supported and enhanced by a number of dispositions or attitudes that are essential dimensions of CT. These ***dispositions or attitudes*** *include:*

- Confidence in dealing with complexity
- Persistence in working with difficult problems
- Tolerance for ambiguity

- The ability to deal with open ended problems
- The ability to communicate and work with others to achieve a common goal or solution



The lessons contained in this unit of study are intentionally designed to support students as they strive to meet the standards described in the Profile of the South Carolina Graduate. Students work collaboratively, communicate information, and actively engage in critical thinking and problem solving as they dive into this exploration of the connections between genetics and probability.

Other information on the standards and indicators in this unit can be found in the support documents/resources on the SC State Department website.

> ***www.ed.sc.gov (Instruction → Standards and Learning → Science → Support Documents and Resources)***

Active Learning strategies and descriptions can be found on the S2TEM Centers SC website in the Disciplinary Literacy Virtual Library:

> ***s2temsc.org (Resources → Disciplinary Literacy Virtual Library → Strategy Warehouse)***

Computational Thinking Reference:

> ***https://csta.acm.org/Curriculum/sub/CurrFiles/CompThinkingFlyer.pdf***
> ***https://csta.acm.org/Curriculum/sub/CompThinking.html***

The lessons contained within this unit are intended to be used for interdisciplinary instruction. The calendar below maps out the order of instruction for both the science and mathematics lessons.

DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
PHYSICS From Dot Motion to Graphing Velocity • Rate: Position as a Function of Time • Position, Velocity, Acceleration			**PHYSICS** Constant Velocity • Motion of a Motorized Cart • Linear Motion	
ALGEBRA 2 Modeling Linear Relationships • Review of Algebra 1 • Distance-Time Graphs	**ALGEBRA 2** Comparing Function Families • Compare quadratic functions with other function families (linear and exponential)		**ALGEBRA 2** Properties of Quadratic Functions • Key features of quadratic functions expressed graphically	

DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
		PHYSICS Changing Velocity at Constant Acceleration • Photo Burst Drop Zone • Quadratic Motion		
ALGEBRA 2 Transformations of Quadratic Functions			**ALGEBRA 2** Modeling Quadratic Relationships	

DAY 11	DAY 12	DAY 13	DAY 14	DAY 15
	PHYSICS Creating One Dimensional Kinematics Problems • Students create tasks for summative assessment of their learning in this unit.			
ALGEBRA 2 Modeling Quadratic Relationships				