EPSD Curriculum and HMH SCIENCE DIMENSIONS 2018 Alignment TEMPLATE

GRADE 8

EPSD Unit 4: Force and Motion
Second Marking Period

<table>
<tr><td colspan="2">Overview: Students use system and system models and stability and change to understanding ideas related to why some objects will keep moving and why objects fall to the ground. Students apply Newton’s third law of motion to related forces to explain the motion of objects. Students also apply an engineering practice and concept to solve a problem caused when objects collide. The crosscutting concepts of system and system models and stability and change provide a framework for understanding the disciplinary core ideas. Students demonstrate proficiency in asking questions, planning and carrying out investigations, designing solutions, engaging in argument from evidence, developing and using models, and constructing explanations and designing solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas.</td><td colspan="4">Science Dimensions Program Resources Module K</td></tr>
<tr><td colspan="2" rowspan="2">Standards: (MS-PS2-1) Apply Newton’s Third Law to design a solution to a problem involving the motion of two colliding objects. (MS-PS2-2) Plan an investigation to provide evidence that the change in an object’s motion depends on the sum of the forces on the</td><td colspan="4">Unit 1: Forces and Motion
Unit Video (ice skater using force); Why it Matters p. 2; Unit Starter p. 3; Unit Project p. 3K; Unit Review pp. 87-90; Vocabulary 3I; Unit Connections pp. 3j, 86; Unit Performance Task p. 91</td></tr>
<tr><td colspan="4">Standard for all Units: (D) Interactive Multilingual Glossary; (D/P) Unit Pretest; (D) Lesson Quizzes; (D/P) Unit Tests

Note: Refer to the Curriculum Alignment Common Language (CACL) Guide to decipher acronyms.</td></tr>
<tr><td>Instructional Days: 25-30</td><td>Lesson 1: Introduction to Forces pp. 4-23

D/P- WIM Questions p. 2

D/P- CYEI (video) Which dog will win the tug of war? p. 5

P- ENB (prompt) Students gather evidence to explain</td><td>Lesson 2: Gravity and Friction pp. 24-43

D/P- WIM Questions p. 2

D/P- CYEI (video) Why did the two objects fall together? p. 25

P- ENB (prompt) Students Gather evidence to explain</td><td>Lesson 3: Newton's Laws of Motion pp. 44-67

D/P- WIM Questions p. 2

D/P- CYEI (video) Why does the golf tee fall into the bottle when the hoop is pulled? p. 45</td><td>Lesson 4: Engineer It: Collisions between Objects pp. 68-85

D/P- WIM Questions p. 2

D/P- CYEI (video) How can Newton’s laws be applied to protect a smartphone screen during a collision? p. 69</td></tr>
</table>

object and the mass of the object. (MS-PS2-4) Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. (MS-ETS1-1) Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (MS-ETS1-2) Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-3) Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. (MS-ETS1-4) Develop a model to generate data for iterative testing and modification of a		how forces can help predict which dog will win the tug of war. p. 5 D/P- Students watch Video of a bulldozer using force. p. 7 P- LS Write a scientific argument describing the situation and forces being applied. p. 8 P- ENB (prompt) Draw a diagram of dogs playing tug of war. Which forces will affect the outcome? p. 11 D/P- HOL Activity Observe Everyday Forces pp. 13-14 D/P- DTM Students work with signed numbers, which represent the magnitude of forces in opposite directions. p. 18 P- ENB (prompt) Think about two	how forces affect falling objects. p. 25 D/P-DTM Students use the ratio the force of gravity between an object and Jupiter and the force of gravity between an object and Earth to calculate the objects weight on Jupiter. p. 27 D/P- HOL Activity Investigate Falling Objects: Mass p. 29 P-ENB (prompt) Students identify how their observations help them interpret the image of the apple and the feather falling? p. 29 D/P- LS Analyze Gravitational Force (Students use evidence provided by the image as a premise for logical arguments about how the distance	P- ENB (prompt) Students gather evidence to help explain the motion of the golf tee. p. 44 D/P- Describing Motions (Students watch video showing the position of a flock of starling to understand motion, in terms of speed, velocity and acceleration.) p. 46 D/P-DTM Students reason abstractly and quantitatively to interpret the graph and determine the average speed. p. 48 D/P-DTM Students work with signed numbers and interpret expressions to calculate velocities. p. 49 D/P-DTM Students work with signed	P- ENB (prompt) Students record evidence that helps them determine how to protect a smartphone screen during a collision. p. 69 D/P- Newton's Second Law of Motion and Collisions: Robots Collide with Identical Balls (A satellite collides with debris in space. Students draw a picture showing the collision) p. 71 D/P- Newton's First law of Motion and Collisions (Students collaborate with a partner, analyze the collision shown in the photo, and use their knowledge of Newton's laws of motion and collisions to

proposed object, tool, or process such that an optimal design can be achieved.		dogs playing tug of war. What data do you need to calculate the net force on the rope? p. 18 D/P- ENGIT Explain Net Forces (Students analyze why trains might need multiple locomotives.) p. 18 D/P- TIF (enrich) Roller Coaster Restraint pp. 19-20 D- Hands-On Labs; TV Science Advisors; Propose Your Own Path D/P- Lesson Self Check pp. 21-23 D- Lesson Quiz D-Make Your Own Study Guide P- DI (ELL/RTI) p. 3I P- Extension p. 3I P- COLLAB p. 3J P- Connections to Other Disciplines p. 3J	between two objects affects the gravitational force they exert on each other.) p. 31 D/P- Exploring Friction Students watch video and explore online to identify why they think one flask of rice can be lifted with the chopstick and the other cannot. pp. 32-33 D/P- HOL Activity Investigate Friction (Students investigate the force needed to move an object against different surfaces and use the evidence they collect to develop an argument about the relationship they observed.) p. 34 D/P- HOL Activity Investigating Falling Objects: Air Resistance	numbers and interpret expressions to calculate acceleration. p. 50 D/P-Friction and Newton's First Law (Students watch Video of penguins moving across the frozen ground and discuss their explanations for the motion of the penguins.) p. 53 P-ENB (prompt) How does Newton's first law apply to the motion of the golf tee that falls from the hoop into the bottle? p. 54 P/D ENGIT Design Vehicles for Safety (Students analyze how airbags solve a problem and if they would work in another situation.) p. 54 D/P- HOL Activity Investigate Motion	describe the motion of the car throughout the collision.) p. 72 D/P- DTM Analyze Acceleration During a Collision (Students analyze the motion before and after two marbles collide and use positive and negative numbers to determine the changes in speed.) p. 74 D/P- Collisions with Objects in Contact (Students watch video of the motion of the balls in the Newton's cradle to observe an example of how collisions work when objects are in contact.) p 75 D/P- LS Based on Newton's laws of motion, students make a claim about, whether or not, once Newton's
Objectives: Students will: Apply Newton's third law to design a solution to a problem involving the motion of two colliding objects. Plan an investigation individually and collaboratively to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.					
Topics: Motion Acceleration Force Friction Gravity Newton's Laws Twenty-First Century Themes and Skills include: • The Four C's • Life and Career Skills • Information and Media literacy					
Essential Questions: How can we predict the motion of an object? If I were able to eliminate air resistance and dropped a feather and a hammer at the same time, which would land first?					

	D-Science Safety HB D- CCC-HB D- ELA-HB D- M-HB D- SEP-HB D-ScienceSaurus Reference HB D- VBP Animals in Motion	(Students describe the force of air resistance and how it affects the motion of a parachute.) p. 37 D/P- ENB (prompt) Students compare the falling objects that they observed and the objects shown in the photo at the beginning of the lesson. p. 38 D/P- ENGIT Improve a Parachute (Students use their knowledge of air resistance to determine how to optimize an engineer's parachute design.) p. 38 D/P- TIF (enrich) Gravity and Space-Time pp. 39-40 D- Snowboarding and Forces; Propose Your Own Path	(Students use a cart to explore the relationship between force, mass, and acceleration.) pp. 56-57 D/P- DTM Students complete a table and a graph to relate force, mass, and acceleration and then compare the data to the data from the Hands-on-Lab. pp. 58-59 P -ENB (prompt) How does Newton's second law apply to the golf tee balanced on the hoop? How does Newton's second law apply to the golf tee when the hoop is being pulled away? p. 59 D/P-ENGIT Relate Vehicle Mass to Performance (Students use their	cradle is set in motion, it stays in motion forever. p. 75 P- ENB (prompt) Why might a smartphone be damaged when it falls on a hard surface? Students record evidence in their ENB. p. 75 D/P- Effects of Collisions (Students imagine a stunt person falling onto an airbag. The airbag is designed to slowly bring the stunt person to a rest. Students then imagine the collision in slow motion. Students draw a series of three images showing the motion of the stunt person at the beginning, the middle, and the end of the collision

		D/P- Lesson Self Check pp. 41-43 D- Lesson Quiz D-Make Your Own Study Guide P- DI (ELL/RTI) p. 3I P- Extension p. 3I P- COLLAB p. 3J P- Connections to Other Disciplines p. 3J D-Science Safety HB D- CCC-HB D- ELA-HB D- M-HB D- SEP-HB D-ScienceSaurus Reference HB	understanding of the relationship between force, mass and acceleration to determine how mass affects the performance of a car.) p. 59 D/P-LS Identify Force Pairs (Students illustrate the forces involved in hitting a piñata, taking into account the action and reaction.) forces. p. 61 D/P- TIF (enrich) Baseball vs Softball pp. 63-63 D- Objects in the Space Station; Propose Your Own Path D/P- Lesson Self Check pp. 65-67 D- Lesson Quiz D-Make Your Own Study Guide	with the airbag.) p. 76 D/P- HOL Activity Testing Packing Materials (Students work in small groups to develop methods to test and compare the effectiveness of different packing materials.) pp. 77-78 D/P- Energy and Collisions (Students watch video online of the motion of the tennis ball before, during, and after a collision.) p. 79 D/P- LS Students explain in detail why the tennis ball shown in the video bounces. Students should use Newton's laws of motion and information from the lesson to support their reasoning. p. 79

			P- DI (ELL/RTI) p. 3I P- Extension p. 3I P- COLLAB p. 3J P- Connections to Other Disciplines p. 3J D-Science Safety HB D- CCC-HB D- ELA-HB D- M-HB D- SEP-HB D-ScienceSaurus Reference HB D- VBP Animals in Motion D- VL Sliding Downhill	P- ENB (prompt) Students explain how the lab results can help them design protection for a smartphone screen during a collision. Students record evidence in their ENB. p. 79 D/P- DTM Analyze the Effect of Collision Duration on Acceleration (Students calculate the acceleration of two objects involved in a collision.) p. 80 D/P- TIF (enrich) Careers in Engineering: Crash Test Engineer pp. 81-82 D- Wrecking Ball Demolitions; Propose Your Own Path D/P- Lesson Self Check pp. 83-85 D- Lesson Quiz

				D-Make Your Own Study Guide P- DI (ELL/RTI) p. 3I P- Extension p. 3I P- COLLAB p. 3J P- Connections to Other Disciplines p. 3J D-Science Safety HB D- CCC-HB D- ELA-HB D- M-HB D- SEP-HB D-ScienceSaurus Reference HB D- YSI Simulation How Can You Design a Safer Road?

EPSD Curriculum and HMH SCIENCE DIMENSIONS 2018 Alignment TEMPLATE

Curriculum Alignment Common Language (CACL) Guide 6-8		
Acronym	**Word/Phrase**	**Description**
CER	Claims Evidence Reasoning	Students make a claim and gather evidence along the way (during EXPLORATORY activities) to support claim.
CCC-HB	Crosscutting Handbook	Students who need extra support in grasping concepts or to refresh student knowledge of skills.
CYEI	Can You Explain It	Lesson phenomenon used to ENGAGE students in learning at the beginning of the lesson.
CYSI	Can You Solve It	Lesson phenomenon used to ENGAGE students in learning at the beginning of the lesson.
D	Digital	Program resources and features in interactive digital form.
DI (ELL/RTI) **Extension** **COLLAB** **Connections to Other Disciplines**	Differentiated Instruction (English Language Learner/Response to Intervention) Collaboration Connections to Other Disciplines	A page that lists all learning activities used to differentiate learning, engage students in collaborative activities and connect learning to other subjects.
DTM	Do the Math	Integrated subject learning.
ENB	Evidence Notebook	Student notebook or journal used to gather evidence during EXPLORATORY learning activities to support their claims.
ENGIT	Engineer It	Integrated subject learning.
ELA-HB	English Language Arts Handbook	Students who need extra support in grasping concepts or to refresh student knowledge of skills.
HOL	Hands-On Lab	Activities or experiments that enable students to demonstrate scientific procedures and analysis.
LS	Language SmArts	Integrated subject learning.

EPSD Curriculum and HMH SCIENCE DIMENSIONS 2018 Alignment TEMPLATE

M-HB	Math Handbook	Students who need extra support in grasping concepts or to refresh student knowledge of skills.
P	Print	Program resources and features in print form.
SEP-HB	Science and Engineer Practices Handbook	Students who need extra support in grasping concepts or to refresh student knowledge of skills.
TIF	Take It Further (enrich)	Enrichment activities for students in digital or print.
VBP	Video Based Project	Real life videos related to science and/or engineering that enable students to demonstrate mastery of performance expectations.
VL	Virtual Lab	Fully interactive simulations in which students perform experiments, collect data and answer questions.
WIM	Why It Matters	Questions related to lessons within each unit that asks students to consider how science affects the world around them.
YSI	You Solve It (Simulation)	Open-ended simulation-based learning with multiple answer options.