Unit 2: Forces and Motion (Forces and Interactions)

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Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Science: Kindergarten

Unit 2: Forces and Motion

Belleville Board of Education

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Unit Overview

In this unit, children will:

- plan and conduct an investigation about the speed of objects
- gather evidence to support or refute ideas about what causes motion
- analyze data from tests to determine if a tool works as intended
- explore pushes and pulls of different strengths and their effect on objects

Enduring Understanding

- Motion is the act of moving.
- Speed is how fast or slow something moves.
- Direction is the path a moving object takes.
- A force is a push or a pull that can make an object move or stop moving.

Essential Questions

Lesson 1:

- What is motion?

Lesson 2:

- How can we change the way things move?

Unit Project:

- How can you score points with a little push?
- How could you move a bottle cap without touching it?
- What evidence can you collect to show the bottle cap has moved?
- What cause-and-effect relationships will occur when the bottle cap moves?

Exit Skills

By the end of Grade K Unit 2, the student should be able to:

- tell about the motion, speed, and direction of objects
- tell how to change the speed and direction of objects

New Jersey Student Learning Standards (NJSLS-S) & NGSS

SEP - Scientific Investigations Use a Variety of Methods

SEP - Analyzing and Intepreting Data

SEP - Planning and Carrying Out Investigations

DCI - Forces and Motion

DCI - Types of Interactions

DCI - Relationships Beteween Energy and Forces

DCI - Defining Engineering Problems

CCC - Cause and Effect

NextGen Science Standards

K-PS2-1	Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
K-PS2-2	Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.
K-PS2-1.3	Planning and Carrying Out Investigations

Interdisciplinary Connections

Do the Math! pp. 50, 58

MA.K.MD.A.1	Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
MA.K.MD.A.2	Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference.
LA.W.K.7	Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).
LA.SL.K.3	Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

Learning Objectives

Lesson 1:

- SWDAT conduct an investigation to determine how changing the speed or direction of an object can affect its motion.

Hands-On Activity 1: SWDAT conduct an investigation about the speed of objects by making a ramp.

Lesson 2:

- SWDAT analyze data to determine if a design solution works as planned to change an object's speed or direction with a push or a pull.

Hands-On Activity 2: SWDAT conduct an investigation of how a collision of two objects changes the direction and speed of the objects.

You Solve It:

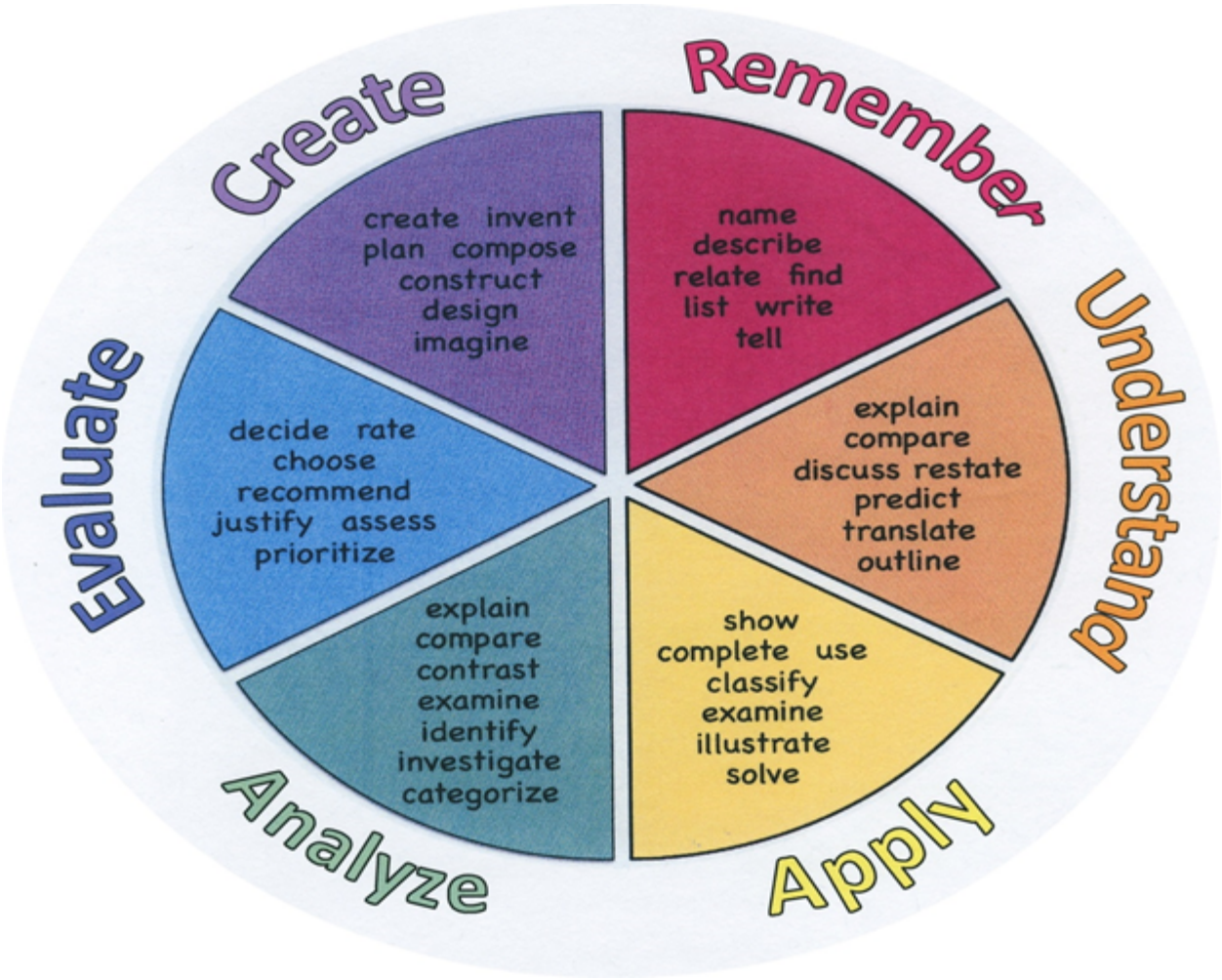
- SWDAT test the strength of a force to reveal patterns in the motion of a ball intended to knock down bowling pins.
- SWDAT test the effect of blocks on the direction of the motion of a ball and its ability to knock down bowling pins.

Unit Project:

- SWDAT create a game of motion using bottle caps and the inside of a box top.
- SWDAT analyze data to see if the objects work as intended.

Action Verbs: Below are examples of action verbs associated with each level of the Revised Bloom's Taxonomy.

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize
Select	Interpret	Sketch	Arrange	Justify	Plan
State	Infer	Solve	Breakdown	Measure	Produce
Count	Match	Use	Combine	Rank	Role Play
Draw	Paraphrase	Add	Detect	Rate	Drive
Outline	Represent	Calculate	Diagram	Support	Devise
Point	Restate	Change	Discriminate	Test	Generate
Quote	Rewrite	Classify	Illustrate		Integrate
Recall	Select	Complete	Outline		Prescribe
Recognize	Show	Compute	Point out		Propose
Repeat	Summarize	Discover	Separate		Reconstruct
Reproduce	Tell	Divide			Revise
	Translate	Examine			Rewrite
	Associate	Graph			Transform
	Compute	Interpolate			
	Convert	Manipulate			
	Discuss	Modify			
	Estimate	Operate			
	Extrapolate	Subtract			
	Generalize				
	Predict				



Suggested Activities & Best Practices

Vocabulary Game - Guess the Word!

Hands-On Activites - Make a Ramp; Build and Test a Marble Run

You Solve It Virtual Lab - Bowling Maze

Unit Project - A Game of Motion

Performance Task - Figure 8 in Motion

Take it Further - Careers in Science and Engineering: Roller Coaster Designer

Assessments

- Pre-Assessment
- Formative: interactive workbook, apply what you know, lesson check/self check
- Summative: assessment guide, lesson quizes, unit test
- Online Assessment

Assessment Evidence - Checking for Understanding (CFU)

- Admit Tickets
- Anticipation Guide
- Compare & Contrast
- Create a Multimedia Poster
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- HMH End-of-Year Test (Benchmark)
- HMH Mid-Year Test (Benchmark)
- HMH Performance-based Assessment (Alternative)
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite

- Quizzes (Formative)
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests (Summative)
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

HMH Science Dimensions: Teacher Edition, Student workbooks, online resources

HMH Equipment & Safety Kits

HMH Science Dimensions S&E Leveled Readers

- On Level: How Can Objects Move?
- Extra Support: How Can Objects Move?
- Enrichment: Magnets Help Us Every Day

Ancillary Resources

https://ngss-assessment.portal.concord.org/

Technology Infusion

HMH Science Dimensions "Explore online" sections embedded throughout online teacher/student edition to extend student learning

HMH Science Dimensions "Can you explain/solve it?" videos embedded throughout online teacher/student edition

Computer-based assessments

Alignment to 21st Century Skills & Technology

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

21st Century Skills/Interdisciplinary Themes

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

21st Century Skills

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

Differentiation

Leveled Readers (On Level, Extra Support, Enrichment)

Reinforce Vocabulary- Help students connect vocabulary to real world examples.

RTI/Extra Support- Provide additional opportunites for hands-on discovery.

Extension Activity for enrichment

ELL- Provide hands-on examples of important concepts (ELL support resources include a glossary in English and Level Readers in Spanish and English)

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals

- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities

- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

Special Education Learning (IEP's & 504's)

- Provide modifications dictated by the IEP/504 Plan
- Modify assessment format
- Check work frequently for understanding

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation
- multiple test sessions

- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

- Provide study guides
- Allow students to correct errors (looking for understanding)
- Allowing productions (projects, models, timelines, demonstrations, charts, etc.) to demonstrate student's learning

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

At Risk

- Tutoring by peers
- Using videos, illustrations, pictures, and drawings to explain or clarify

- Decreasing the amount of work represented or required

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Talented and Gifted Learning (T&G)

- Advanced problem-solving
- Higher order, critical and creative thinking skills, and discovery
- Utilize project based learning for a greater depth of knowledge

- Above grade level placement option for qualified students
- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Flexible skill grouping within a class or across grade level for rigor

- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

Sample Lesson