Unit 3: Motion (Forces and Interactions)

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Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Science: Grade 3

Unit 3: Motion

Belleville Board of Education

102 Passaic Avenue

Belleville, NJ 07109

Prepared by: Ms. Natalie Minichini

Dr. Richard Tomko, Ph.D., M.J., Superintendent of Schools

Ms. LucyAnn Demikoff, Director of Curriculum and Instruction K-12

Ms. Nicole Shanklin, Director of Elementary Education

Mr. George Droste, Director of Secondary Education

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Unit Overview

Unit three focuses on motion. Students will explore types of forces and motion. Students will learn about the relationship between forces and motion. Students will learn how to identify patterns in motion.

(Reference HMH Science Dimensions, Unit 3)

Enduring Understanding

- Motion is the change in position of an object.
- Scientists learn more about animals by studying movements.
- Unbalanced forces affect motion of an object (speed up, slow down, change direction).
- Speed is affected by forces.
- Speed is calculated using time and distance.

Essential Questions

- What is motion?
- What are some patterns in motion?
- What causes patterns of motion?
- What is needed for a change in motion to occur?
- What causes changes in speed and direction?

Exit Skills

By the end of Unit 3, students will be able to:

- Provide evidence that patterns can be used to predict future motion.
- Describe ways that unbalanced forces affect the motion of an object.
- Identify specific reasons why motion changes as a result of the forces acting on them.
- Define problems related to forces and motion.

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

SEP - Asking Questions and Defining Problems

SEP - Planning and Carrying Out Investigations

SEP - Scientific Knowledge is Based on Empirical Evidence

DCI - Forces and Motion

CCC - Cause and Effect

CCC - Patterns

NextGen Science Standards

3-PS2-1	Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
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-PS2-2.PS2.A.1	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. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.)
3-PS2-1.PS2.A.1	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. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.)
3-PS2-4.PS2.B.1	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.
3-PS2-3.PS2.B.1	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.
3-PS2-1.PS2.B.1	Objects in contact exert forces on each other.

Interdisciplinary Connections

Connections to Math:

- **MP.2** Reason abstractly and quantitatively.
- **MP.3** Construct viable arguments and critique the reasoning of others.

LA.RI.3.1	Ask and answer questions, and make relevant connections to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
LA.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.
LA.RI.3.7	Use information gained from text features (e.g., illustrations, maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).
LA.RI.3.10	By the end of the year, read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
LA.W.3.10	Write routinely over extended time frames (time for research, reflection, metacognition/self-correction and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
LA.SL.3.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
LA.SL.3.1.A	Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.
LA.SL.3.1.B	Follow agreed-upon norms for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
LA.SL.3.1.C	Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.
LA.SL.3.1.D	Explain their own ideas and understanding in light of the discussion.
LA.SL.3.2	Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
LA.SL.3.3	Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

TECH.8.1.2	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.2.2	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

Learning Objectives

In Unit 3, students will demonstrate the ability to

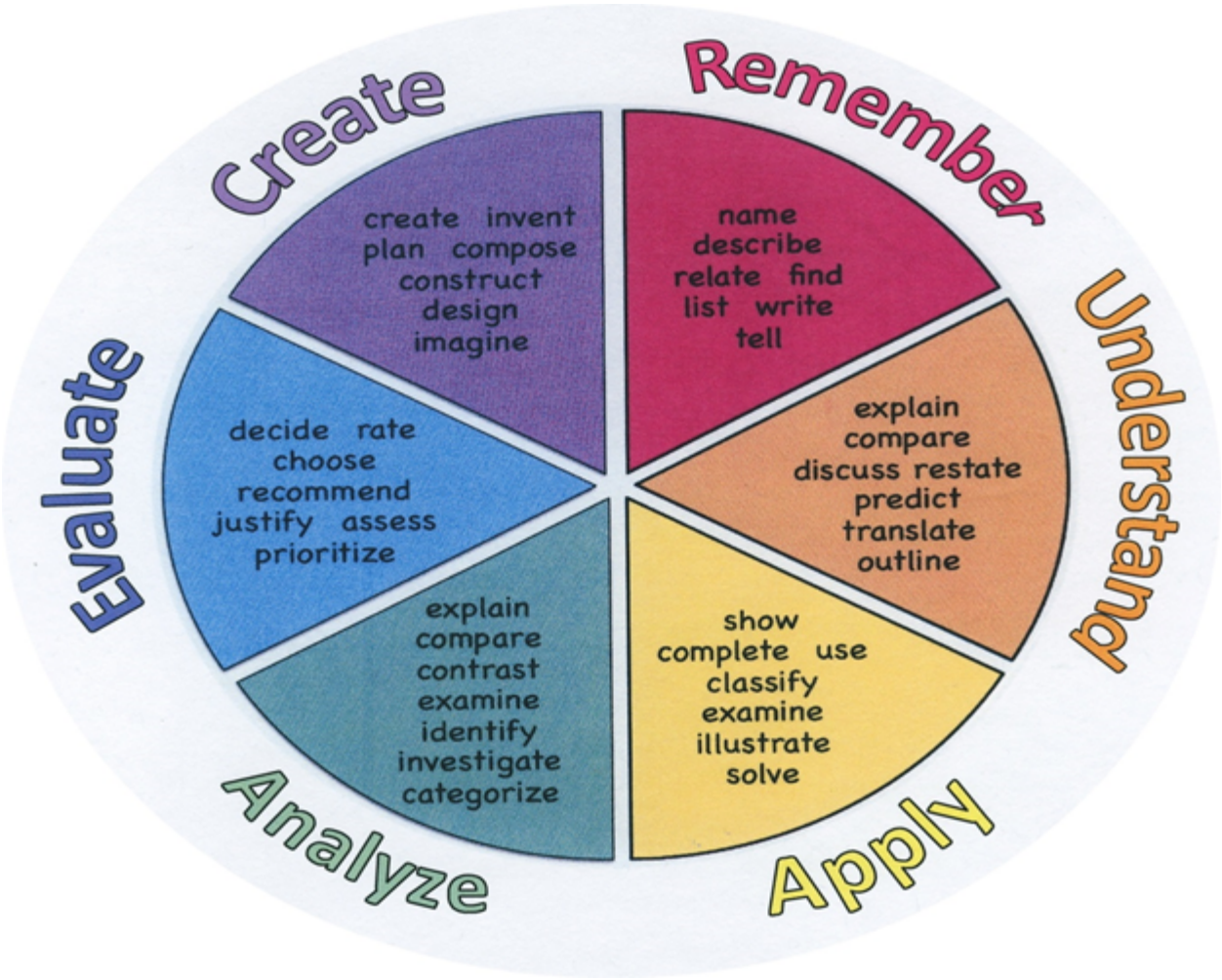
Lesson 1: What is Motion?

- Determine how force affects motion and explain how speed is determined.
- Analyze the cause-and-effect relationships between force and speed. Explain how they cause an object to change position.
- Analyze situations to determine if the force is balanced or unbalanced.

Lesson 2: What Are Some Patterns in Motion?

- Determine the benefits of observing patterns in motion.
- Categorize situations based on the type of motion.

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

HMH Science Dimensions, Unit 3- Lesson 1:

- **Engage:** "Can You Solve It?" lesson
- **Explore/Explain:** "Here or There", "Speed it Up" lessons and hands-on activity (Exploration 1 & 2)
- **Elaborate:** Take it Further - People in Engineering extension activity
- **Evaluate:** "Lesson Check" and "Lesson Roundup" assessments (formative/summative)

HMH Science Dimensions, Unit 3 - Lesson 2:

- **Engage:** "Can You Solve It?" lesson
- **Explore/Explain:** "Back and Forth, Up and Down" lessons and hands-on activity (Exploration 1)
- **Elaborate:** Take it Further - Careers in Science and Engineering extension activity
- **Evaluate:** "Lesson Check" and "Lesson Roundup" assessments (formative/summative)

HMH Science Dimensions, Unit 3 - Performance Task (Hunting for Treasure)

- State Your Goal
- Research
- Brainstorm
- Make a Plan
- Communicate

HMH Science Dimensions, Unit 3 - Unit Project (Motion Detectives):

- Research and Plan
- Analyze Results
- Restate Question
- Claims, Evidence, and Reasoning

Assessment Evidence - Checking for Understanding (CFU)

- Admit Tickets
- Anticipation Guide
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- 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
- Multimedia Reports
- 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 Do We Use Machines?
- Extra Support: How Do We Use Machines?
- Enrichment: Building With Machines

Ancillary Resources

- PBS Learning Media (The Art of Forces and Motion)
- Nonfiction books (motion)
- Sid the Science Kid (Force and Motion)
- https://ngss-assessment.portal.concord.org/

Technology Infusion

- HMH Science Dimensions Digital Components
- Kahoot (Forces and Motion)

- Magic School Bus (Magic School Bus Plays Ball)



Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

Alignment to 21st Century Skills & Technology

21st Century Skills & Technology:

- English Language Arts
- Technology
- Mathematics

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
- Information Literacy

21st Century Skills

- Environmental Literacy
- Global Awareness

Differentiation

The following differentiation strategies will be utilized:

- As needed, provide more instruction that is on level or below grade level for the students who are struggling.
- Monitor progress, reteach as needed, and extend student thinking.
- Utilize multiple intelligences teaching strategies.

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)

The following strategies will be employed for students with IEP's and 504's:

- Provide modifications as dictated in the student's IEP/504 plan.
- Check work frequently for understanding.
- Extended time on tests/quizzes

- 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)

The following strategies will be employed for English Language Learners:

- Decreasing the amount of work presented or required.
- Using videos, illustrations, pictures, and drawings to explain or clarify.
- Allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, 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

The following strategies will be employed for At Risk Learners:

- Decreasing the amount of work presented or required.
- Teaching key aspects of a topic. Eliminate nonessential information.
- Tutoring by peers.

- 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)

The following Talented and Gifted adaptations will be employed:

- Higher order, critical & creative thinking skills, and discovery.
- Flexible skill grouping within a class or across grade level for rigor.
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities.

- 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

Unit Name: Chapter 1-

NJSLS: See Link Below

Interdisciplinary Connection: See Link Below

Statement of Objective:

Anticipatory Set/Do Now:

Learning Activity:
Student Assessment/CFU's:

Materials:

21st Century Themes and Skills:

Differentiation/Modifications:

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Integration of Technology: