# Motion and Matter

Content Area: **Science**
Course(s):
Time Period: **Marking Period 1**
Length: **5 weeks**
Status: **Published**

## Course Pacing Guide

| Unit | MP/Trimester | Weeks |
|---|---|---|
| Water and Climate | 1 | 5 |
| Motion and Matter | 2 | 5 |
| Structures of Life | 3 | 5 |

## Unit Overview

Motion and Matter provides grade 3 students with experiences around physical sciences core ideas dealing with forces and interactions, matter and its interactions, and with engineering design.

**Unit Rationale**

Magnetism and gravity are the forces students explore as they look for patterns of motion to predict future motion. Students work with magnets and paper clips, wheel-and-axle systems, paper air twirlers, and rotating tops. Students use their knowledge of science to enter the engineering design process and through the process refine their science understanding.

Students build on the science concepts of matter and its interactions developed in grade 2 using new tools to quantify observations. Students use metric tools to refine observations by measuring mass and volume, they make mixtures and solutions to develop a foundational understanding of conservation of mass, and they observe a simple chemical reaction to extend their understanding of conservation. These new experiences with matter will prepare students for the disciplinary core ideas introduced in grade 5.

## Enduring Understandings

Energy and Change

- Magnetic forces between a pair of objects do not require that the objects be in contact.
- The strength of the force depends on the properties of the objects and their distance apart.
- The interaction between magnets depends on their orientation (sometimes they attract and sometimes they repel).
- Unbalanced forces (pushes or pulls) result in change of motion.
- Gravity is the force that pulls masses toward the center of Earth.
- The pattern of an object's motion in various situations can be observed and measured.
- When past motion exhibits a regular pattern, future motion can be predicted from it.
- A wheel-and-axle system with two sizes of wheels describes a curved path.
- A twirly bird is a simple winged system that spins when it interacts with air; variables affect twirler performance.
- Tops exhibit rotational motion (spinning) when torque is applied to the axial shaft; variables affect top performance.
- 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).
- Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.
- The pattern of an object's or system's motion in various situations can be observed and measured.
- When past motion exhibits a pattern it can be used to predict future motion.
- A mixture is two or more materials distributed evenly throughout one another.
- A special class of mixture, a solution, results when a solid material dissolves (disappears) in a liquid.
- Starting materials change into new materials during chemical reactions.

Mass is neither created nor destroyed during physical and chemical interactions. Matter is conserved.

## Essential Questions

- What happens when magnets interact with other magnets and with paper clips?
- How is the magnetic field affected when more magnets are added?
- What causes change of motion?
- How can we change the motion of wheels rolling down ramps?
- What rules help predict where a rolling cup will end up?
- Student-created question, e.g., What happens to the motion of a twirly bird when the wing length changes?
- What is the best design for a top?
- What are some important features of a cart that will roll from here to there?
- How can you improve the design of your cart?
- Student-created questions, e.g., How does start position affect how far a cart rolls?
- How can you use magnets to do cart tricks?
- What happens when you mix two materials?
- What happens when you mix two materials?
- What is the importance of accurate measurements for a metric field day?

## New Jersey Student Learning Standards (No CCS)

Disciplinary Core Ideas

PS1.A: Structures and properties of matter: The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. Measurements of a variety of properties can be used to identify materials.

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. 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.

PS1.B: Chemical reactions:When two or more different substances are mixed, a new substance with different properties may be formed. No matter what reaction or change in properties occurs, the total weight of the substances does not change.

ETS1.A: Defining and delimiting engineering problems: Possible solutions 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: 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.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.

## Amistad Integration

## Holocaust/Genocide Education

## Interdisciplinary Connections

**Unit Summary:**

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**Primary interdisciplinary connections:**

ELA/Literacy –

RF 4c: Use context to confirm understandings of words.

RI 1: Ask and answer questions.

RI 2: Determine the main idea of a text.

RI 2: Determine the main idea of a text; recount the key details.

RI 3: Describe the relationship of scientific ideas or concepts.

RI 3: Describe the relationship between scientific ideas using cause and effect.

RI 4: Determine the meaning of domain-specific words and phrases in text.

RI 5: Use text features to locate information.

RI 6: Distinguish their own point of view from that of the author of a text.

RI 7: Use information gained from illustrations to demonstrate understanding of the text.

RI 10: Read and comprehend science text.

RF 4c: Use context to confirm understandings of words.

W 3: Write narratives.

SL 1: Engage in collaborative discussions.

SL 3: Ask and answer questions about information from a speaker.

SL 4: Report on a topic or text.

SL 5: Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace.

L 4: Determine or clarify the meaning of new or unknown words.

L 5: Demonstrate understanding of word relationships.

L 6: Acquire and use domain-specific words.

Mathematics

MP.2 Reason abstractly and quantitatively. (3-PS2-1)

MP. 5 Use appropriate tools strategically. (3-PS2-1)

3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve

one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent

the problem. (3-PS2-1)

## Technology Standards

| | |
|---|---|
| TECH.8.1.5.A | Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations. |
| TECH.8.1.5.C | Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. |
| TECH.8.1.5.F | Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. |

## 21st Century Themes/Careers

**21st Century Themes:**

Digital media will be used incorporated in project presentations. This module will develop students' abilities to do and understand scientific inquiry. Students will identify questions, design and conduct scientific investigations to answer those questions, employ tools to gather, analyze, and interpret data. They will use data to construct reasonable explanations, develop and communicate investigations and evidence and understand that scientists use different kinds of investigations and tools to develop explanations using evidence and knowledge. This module will develop and extend students' understandings about science and technology. Students will work collaboratively in teams and use tools and scientific techniques to make better observations.

## Financial Literacy Integration

## Instructional Strategies & Learning Activities

- Start with review
- Present new material in small steps
- Think Aloud/ modeling
- Guided Practice
- State the objective
- Use graphic organizers/ anchor charts
- Concept sorting
- Check for understanding
- Provide feedback
- Workshop model
- Gradual release of responsibility
- Student-led discussion strategies
- Cooperative learning
- Tiered instructional activities
- Differentiation
- Small group instruction

## Differentiated Instruction

- Curriculum Map
- Inquiry/Problem-Based Learning
- Learning preferences integration (visual, auditory, kinesthetic)
- Sentence & Discussion Stems
- Tiered Learning Targets
- Learning through play
- Meaningful Student Voice & Choice
- Relationship-Building & Team-Building
- Self-Directed Learning
- Choice Boards
- Debate
- LMS use
- Mock Trial
- The Hot Seat/Role-Play
- Student Data Inventories
- Mastery Learning (feedback toward goal)
- Goal-Setting & Learning Contracts
- Game-Based Learning
- Grouping
- Socratic Seminar
- Genius Hour
- Rubrics
- Learning Menus

- Jigsaws
- Learning Through Workstations
- Concept Attainment
- Flipped Classroom
- Mentoring
- Assessment Design & Backwards Planning
- Student Interest & Inventory Data

## Formative Assessments

**Assessments:**

- Response Sheets
- Performance Assessments
- Science Notebook Entries

## Summative Assessment

- Investigation I-Checks
- Surveys
- Post-Test

## Benchmark Assessments

- Investigation I-Checks
- Surveys
- Post-Test

## Resources & Technology

Fossweb.com

## BOE Approved Texts

FOSS Motion and Matter

## Closure

- Snowstorm - Students write down what they learned on a piece of scratch paper and wad it up. Given a signal, they throw their paper snowballs in the air. Then each learner picks up a nearby response and reads it aloud.
- Parent Hotline - Give students an interesting question about the lesson without further discussion. Email their guardians the answer so that the topic can be discussed over dinner.
- DJ Summary - Learners write what they learned in the form of a favorite song. Offer to let one or two sing thier summary.
- Gallery Walk - On chart paper, small groups of students write and draw what they learned. After the completed works are attached to the classroom walls, others students affix post-its to the posters to extend on the ideas, add questions.
- Sequence It - create timelines of major events discussed
- Low-Stakes Quizzes - Give a short quiz using technologies like Kahoot or a Google form.
- Have students write down three quiz questions (to ask at the beginning of the next class).
- Question Stems - Have students write questions about the lesson on cards, using question stems framed around Bloom's Taxonomy. Have students exchange cards and answer the question they have acquired.
- Kids answer the following prompts: "What takeaways from the lesson will be important to know three years from now? Why?
- Have students dramatize a real-life application of a skill.
- Ask a question. Give students ten seconds to confer with peers before you call on a random student to answer. Repeat.
- Have kids orally describe a concept, procedure, or skill in terms so simple that a child in first grade would get it.
- Direct kids to raise their hands if they can answer your questions. Classmates agree (thumbs up) or disagree (thumbs down) with the response.
- Have kids create a cheat sheet of information that would be useful for a quiz on the day's topic.
- Kids write notes to peers describing what they learned from them during class discussions.
- Ask students to summarize the main idea in under 60 seconds to another student acting as a well-known personality who works in your discipline. After summarizing, students should identify why the famous person might find the idea significant.
- Have students complete the following sentence: "The [concept, skill, word] is like _____ because _____."
- Ask students to write what they learned, and any lingering questions on an "exit ticket". Before they

leave class, have them put their exit tickets in a folder or bin labeled either "Got It," "More Practice, Please," or "I Need Some Help!"
- After writing down the learning outcome, ask students to take a card, circle one of the following options, and return the card to you before they leave: "Stop (I'm totally confused. Go (I'm ready to move on.)" or "Proceed with caution (I could use some clarification on . . .)"

## ELL

- Alternate Responses
- Advance Notes
- Extended Time
- Teacher Modeling
- Simplified Written and Verbal Instructions
- Frequent Breaks
- E-Dictionaires
- Google Translate

## Special Education

- Shorten assignments to focus on mastery of key concepts.
- Shorten spelling tests to focus on mastering the most functional words.
- Substitute alternatives for written assignments (clay models, posters, panoramas, collections, etc.)
- Specify and list exactly what the student will need to learn to pass.
- Evaluate the classroom structure against the student’s needs (flexible structure, firm limits, etc.).
- Keep workspaces clear of unrelated materials.
- Keep the classroom quiet during intense learning times.
- Reduce visual distractions in the classroom (mobiles, etc.).
- Provide a computer for written work.
- Seat the student close to the teacher or a positive role model.
- Use a study carrel. (Provide extras so that the student is not singled out.)
- Provide an unobstructed view of the chalkboard, teacher, movie screen, etc.
- Keep extra supplies of classroom materials (pencils, books) on hand.
- Maintain adequate space between desks.
- Give directions in small steps and in as few words as possible.
- Number and sequence the steps in a task.
- Have student repeat the directions for a task.
- Provide visual aids.
- Go over directions orally.
- Provide a vocabulary list with definitions.
- Permit as much time as needed to finish tests.

- Allow tests to be taken in a room with few distractions (e.g., the library).
- Have test materials read to the student, and allow oral responses.
- Divide tests into small sections of similar questions or problems.
- Allow the student to complete an independent project as an alternative test.
- Give progress reports instead of grades.
- Grade spelling separately from content.
- Allow take-home or open-book tests.
- Show a model of the end product of directions (e.g., a completed math problem or finished quiz).
- Stand near the student when giving directions or presenting a lesson.
- Mark the correct answers rather than the incorrect ones.
- Permit a student to rework missed problems for a better grade.
- Average grades out when assignments are reworked, or grade on corrected work.
- Use a pass-fail or an alternative grading system when the student is assessed on his or her own growth.

## 504

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

## At Risk

- Use of mnemonics
- Have student restate information
- Provision of notes or outlines
- Concrete examples
- Use of a study carrel
- Assistance in maintaining uncluttered space
- Weekly home-school communication tools (notebook, daily log, phone calls or email messages)
- Peer or scribe note-taking
- Lab and math sheets with highlighted instructions

- Graph paper to assist in organizing or lining up math problems
- Use of manipulatives
- No penalty for spelling errors or sloppy handwriting
- Follow a routine/schedule
- Teach time management skills
- Verbal and visual cues regarding directions and staying on task
- Adjusted assignment timelines
- Visual daily schedule
- Immediate feedback
- Work-in-progress check
- Pace long-term projects
- Preview test procedures
- Film or video supplements in place of reading text
- Pass/no pass option
- Cue/model expected behavior
- Use de-escalating strategies
- Use peer supports and mentoring
- Have parent sign homework/behavior chart
- Chart progress and maintain data

## Gifted and Talented

Focus on effort and practice

Offer the Most Difficult First

Offer choice

Speak to Student Interests

Allow G/T students to work together

Encourage risk taking