**Lesson Cycle**

**Lesson Title/Topic:** Motion Matters

**Target Concept:** Force, Motion and Energy (3rd grade)

**Standards/Rationale:** 112.14 (b)(6)(B)--Demonstrate and observe how position and motion can be changed by pushing and pulling objects such as swings, balls, etc.

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| **Learning Target:**Students will demonstrate a Newton’s Cradle by running a series of trials at four different distances with 70% accuracy. | **Assessment:**Completed worksheet. |

**Materials:** Textbook, Newton’s Cradle video (<https://www.youtube.com/watch?v=2OTOgTZRmNw> ), Project supplies (4 yard sticks, pre-cut string, 12 same size fishing weight balls, 4 project boards blank, masking tape, 4 protractor/rulers, 4 markers), worksheets

**Lesson Cycle: (Direct Instruction, Pair and Share, Carousel Project)**

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| **The teacher will:** | **The student will:** |
| **Focus/Mental Set:** * Play the video (<https://www.youtube.com/watch?v=2OTOgTZRmNw> ).
* Instruct students to come into the classroom and stand behind their seat without touching it.
* Have students to push and pull their seats.
* Ask engaging questions to relate the motion of the chairs with pushing and pulling.
* Introduce Isaac Newton and the 1st Law of Motion in a short skit.
 | * Watch the video clip playing at the front of the classroom.
* Follow the instruction to stand behind their seat.
* Place their right hand on the chair and push and pull as instructed, then use their left hand to repeat the motion.
* Answer questions about the movement of the chair.
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| **Teacher Input:** * Use the textbook and introduce Chapter ##, Page ##.
* Go into detail about Isaac Newton as stated in the text.
* Provide greater detail on the Law of Motion from page ##.
* Relate the Law of Motion to daily life, i.e. kicking a soccer ball, pushing a stroller.
* Using the Mix, Pair, Share cooperative learning strategy, stop the class and have them turn to a partner and tell them who Isaac Newton is in their own words.
* Ask each student to give one word to describe Isaac Newton
* Introduce the idea gravity to the students.
* Provide the definition of gravity.
* Give examples of gravity pulling a soccer ball that has been kicked up in the air.
* Stop the class and have everyone turn to a new partner. Have them tell each other what the 1st Law of Motion is and what it means/how it relates to them.
* Continue discussing gravity with the text, Page ##.
* Provide one on one time with ELL students. Show picture flash cards of Push, Pull, & Gravity. Have students say the word and demonstrate the action Do this until the students fully understand the terms. Then continue with picture flash card of Isaac Newton, Newtons Cradle and the “1st Law of Motion”. Have student demonstrate their understanding of these words. Then combine all 6 flash cards and test understanding.
* *Time permitting: Assessment, have all students close books and have a blank paper. Read the question on page ##*
* *Have each student quietly answer the question individually.*
* *Tell each student to pair with a new partner to review if they answered the questions correctly. They can use their textbooks to find the answer.*
* *Have all students stand and ask the questions aloud and have the class collectively say the correct answer simultaneously.*
 | * Actively follow along in the textbook and listen to the details of the lesson.
* When asked, the student will pair and share with a partner, explain in their own words who Isaac Newton was.
* When asked, the student will pair and share with a partner what the 1st Law of Motion is and how it relates to them.
* Say the word shown and complete the action. Gravity = drop pencil to the ground, Push = push the pencil across the desk, Pull = pull the pencil across the desk
* Say the word shown and complete the action. Isaac newton=pretend to bite an apple, Newton’s cradle= sway back and forth, 1st law of motion= one finger up then collide into the other hand
* *Time permitting: quietly answer the questions asked without using the textbook.*
* *Pair and share with partner and use the textbook, if needed, to find the answer.*
* *Participate in saying the answer aloud when instructed.*
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| **Guided Practice:** * ELL students will gather together students are to demonstrate understanding of key vocabulary words and concepts: Isaac Newton, gravity, force, motion, position, Newton’s Cradle, & law. If understanding is not clear those students should watch the video to further develop understanding. <https://www.youtube.com/watch?v=o5IRyIBgDiM>

Once understood students can be added to other groups to complete group activity.* Divide students into four groups and assign them a spot in the classroom to complete the project.
* Pass out the materials needed for the project. Each box is labeled 1-4 to coordinate with the 4 stations. Each station has a different distance they are pulling the first ball back, this distance is pre measured on the poster board and the poster board is numbered along with the box of supplies for that station.
* Give the instruction on how to build their Newton’s Cradle: 2 chairs back-to-back, yardstick on top of the chairs with 3 fishing weights hanging an equal distance down. The project poster board is placed behind and masking tape is put where each weight hangs. Use the protractor to measure the proper distance to pull the first ball back. The measurements are already pre marked on each poster board but have the students measure it so they use a protractor and understand the distance. (3 inches at station 1, 6 inches at station 2, 9 inches at station 3, 12 inches at station 4).
* Monitor and assist as needed.
* Instruct the class that they are to record three measurements on the worksheet (Motion Matters), then rotate to the next station and complete the next three measurements with the different variable of the distance pulled back.
* Continue until all stations have been completed.
* Set timer for 10 minutes to build and 10 minutes to collect data from all 4 stations. Make sure students are not taking more than 3 minutes per station (help where needed)
* Have students clean area.
* Have students go back to their seats
 | * ELL students gather and are given a chance to demonstrate understanding of terms and concepts. Students are encouraged or required to watch the ELL video for the subject matter prior to engaging in group activity.
* Gather in assigned groups in the designated spot.
* Begin building the Newton's Cradle per the instruction.
* Mark how far the third ball travelled on the poster board. Then measure the distance and record the data on the Motion Matters worksheet.
* Complete each of four stations 2-3 minutes per station.
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| **Independent Practice:** * Have each student answer the following questions on the assigned worksheet using their textbook:
	+ Who was Isaac Newton?
	+ How many Laws of Motion are there?
	+ What is the First Law of Motion?
	+ By applying a \_\_\_\_ to an object you can change its\_\_\_\_.
	+ \_\_\_\_ and \_\_\_\_ are types of forces you can use to put something in motion.
	+ The \_\_\_\_ \_\_\_\_ shows how motion changes when a ball is pulled back and released.
	+ Did the distance that the first ball was pulled back change the distance the third ball traveled?
	+ Explain why
* Supervise the students as they do their worksheets.
* ELL learners will work at one table on their worksheet. Peer tutor will work at the same table to help with proof-reading. Read the questions allowed to the student and let them begin to write their answer. Anytime one of the key vocabulary words are said student should do the action from previous exercise (i.e. gravity= drop pencil). Continuously have students read what they wrote allowed to build on speech adjustments.
 | * Use the textbook to answer the questions on the Motion Matters worksheet.
* Use the data they collected from the project to formulate ideas of the concept of motion.
* Submit the worksheet for grading.
* Work at table and complete worksheet acting out key vocabulary words. When asked read their answer allowed.
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| **Closure:*** Have each student write their name on an index card along with their favorite thing they learned today.
* Have students exchange cards with a new partner and read them to each other.
* Have students swap cards back and turn them in on the way out of class.
 | * Record their favorite thing they learned on an index card.
* Stand up, pick a partner, swap and read their cards to each other.
* Swap back and turn the card into the teacher.
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| **Options:** |  |
| **Enrichment:** Challenge students to YouTube/research videos of Newton’s Cradle and a Pendulum. Have students determine the difference in the two and challenge them to build their own pendulums in pairs with supplies in the classroom. | **Reteach:** |

**Modifications/Correctives:**

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| **(ASD - Autism)*** Provide student with modified worksheet which will contain: answers to the first 2 questions written in child friendly tone. Also, have sample pictures of newton’s cradle and results at each station. To aid in answering observation questions.
* Allow extra time for worksheet completion, along with one on one time with teacher/teacher aid.

**(Slight hearing Impairment)*** Have student work with partner throughout the guided practice, partner makes sure student “hears” what is going, uses written language when needed.
* Provide student with one on one time with teacher/teacher aid prior to independent practice to ensure understanding of observations and assignment.

**(Social anxiety)*** Allow smaller group (2 or 3 individuals) to work together during guided practice to prevent anxiety.
* This group selects a person to coordinate with another team to compare data if time runs out to run all test trials.

**(ELL)*** Students will add to their personal dictionary during the teacher input lecture, using the text to help spell the word in their dictionary students will then go back and add their own definition of the word. This will be done prior to the activity of building the newton’s cradle. Some **vocabulary words** to be added include: Isaac Newton, gravity, force, motion, position, Newton’s Cradle, & law. Monitor and assist student with developing definitions.
* Guided practice is all group activity, have ELL learner take their dictionary with them and they are to give examples of the terms during the group activity. Have other partners quiz the ELL learner and each other on the vocabulary during the activity time.
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**References:** <https://www.youtube.com/watch?v=2OTOgTZRmNw>