Subject Integrative STEM: Axle and Wheel	**Grade Level** Preschool: age 5

PA Standards

Science and Technology and Engineering Education PA Standards

- 3.2.PK.B1: Explore and describe motion of toys and objects.

Math PA Standards

- 2.3.PK.B: Use concrete objects as non-standard units to estimate and measure, with adult awareness.
- 2.3.PK.F: Compare concrete objects to estimate and verify measurements of length.
- 2.4.PK.A: Describe the process (es) (e.g., think aloud) related to problem solving situations.

PA Learning Standards for Early Childhood (constructing, organizing, and applying knowledge)

- AL.1 PK.A Explore and ask questions to seek meaningful information about a growing range of topics, ideas, and tasks.
- AL.1 PK.B Demonstrate a willingness to participate in new and challenging experiences.
- AL.2 PK.A Work toward completing a task, even if challenging, and despite interruptions.
- AL.2 PK.B Independently break simple tasks into steps and complete them one at a time.
- AL.2 PK.C Attempt to accomplish challenging tasks by employing familiar and new strategies as needed.
- AL.4 PK.C Attempt problem solving activities to achieve a positive outcome.

Reading, Writing, Speaking, and Listening PA Standards

- 1.4.PK.A: Write, dictate or illustrate to convey ideas for a specific purpose.
- 1.4 PK.B: With prompting and support, draw/ dictate about one specific topic.
- 1.4.PK.B: Write, dictate, or illustrate to communicate information.
- 1.6.PK.A: Listen attentively and respond in conversation.
- 1.6.PK.B: Speak in simple sentences. Share experiences when asked.

Objectives:

- With the teacher's help, the students will be able to create their own axle and wheel with 100% accuracy.
- Student's will be able to draw an example of an axle and wheel in their 'Simple Machines' flipbook with 100% accuracy.
- Students will be able to explain their drawing to a partner with 100% accuracy.

Materials:

- Book-*Tires, Spokes, and Sprockets: a book about wheels and axles* by Michael Dehl
- Simple Machine flipbooks
    - markers
- Creeper (thing that is used to roll under cars to work on)
- Car and Ramp Building Supplies
    - Styrofoam
    - water bottles
    - water bottle caps
    - straws
    - wooden skewers (pointed ends cut off)
    - cardboard
    - clear tape
    - masking tape
    - blocks
- Poster paper

Lesson Activator (Set Purpose):

- Read *Tires, Spokes, and Sprockets*, this book will start introducing some different examples of how axles and wheels fit into our everyday life
- Ask students questions throughout the book
    - I did not have access to the book, so I cannot make specific questions about it
- We will make a quick classroom poster that has examples of axles and wheels on it
- "Now that we have read this book, and have seen some examples of axles and wheels we are going to now do some experiments with how axles and wheels help things move easier."

Body of Lesson:

Creeper

- "Today we are going to work with axles and wheels, and we have already seen some examples of these in the book we read."
- "Axles and wheels help things move easier. We are going to see an example of this today."
    - have the student pair up, and have them sit on the floor criss cross applesauce
        - "Do you think it will be easy to move your partner across the ground?" (call on a few students to share their ideas)
        - "Now gently try and push your partner across the ground."
        - "See, it is not very easy to move a heavy object across the floor. What if you tried using some wheels and axles?"
            - have the students try out the Creeper and how it helps the students be able to move each other; really point out the axle and wheels being used

Things that Move

- Build a ramp (cardboard and blocks), touch back on that this ramp is an example of an inclined plane
- Split the students into small groups (can also be done with a large group
    - The students will be taking objects (cardboard pieces, styrofoam pieces, and water bottles) and rolling/sliding them down the ramp
    - After they try to make it move down the ramp they should start me realizing that some of the materials are very difficult to move (ex. styrofoam and cardboard) and others are not very stable when they do roll (ex. water bottle)
        - How well did your objects move down the ramp? How can we make them move easier and more stable?"
            - have them construct cars using straws, cardboard, styrofoam, water bottles, water bottle lids, tape, etc.
        - Have the students test out their new cars,and allow them to travel around and check out what their friends built

Lesson Summarizer (Closure & Wrap-Around to Purpose):

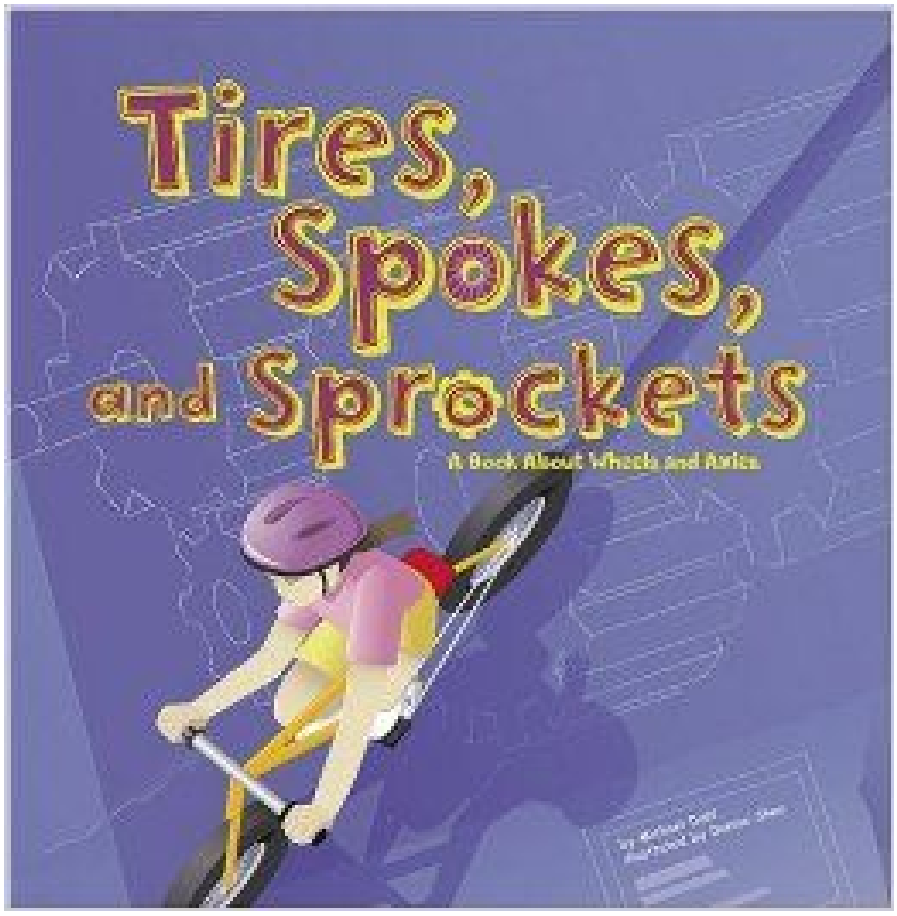
- Gather the students back for whole class talk: "What we did today was work with axles and wheels, and axles and wheels are a simple machine. Axles and wheels help move heavy things easier by making them roll."
    - have everyone share with the group the car they constructed
- "We got to see today how axles and wheels can help things move much easier. Without the axles and wheels we were unable to move each other around, but with their help it was so easy."
- "We made this poster showing examples of axles and wheels. We will hang the poster in the classroom as we work on more simple machines."
- "Now let's get out our 'Simple Machine' flip books and draw pictures of axles and wheels."

Formative or Summative Assessment of Student Learning:

- The students will draw pictures of axle and wheels in their 'Simple Machine' flipbooks.
    - The teacher will observe the students drawings, and provide assistance and redirection when needed.
- They will do a pair and share at the carpet once they are done with their pictures.
    - The teacher will observe the students as they explain their pictures to their partner.
- The teacher will also observe the students throughout the lesson to provide assistance and redirection to the students. The teacher should also ask probing thoughtful questions about what the students are doing during the lesson.

References:

- Book-*Tires, Spokes, and Sprockets: a book about wheels and axles* by Michael Dehl


Tires, Spokes, and Sprockets
A Book About Wheels and Axles