Grade Levels for Recommended Use:  4th

Mathematics TEKS:  4.1(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;  4.4 Number and Operations: The student applies mathematical process standards to develop and use strategies and methods for whole number computations and decimal sums and differences in order to solve problems with efficiency and accuracy;  4.18 Geometry and Measurements(C) solve problems that deal with measurements of length, intervals of time, liquid volumes, mass, and money using addition, subtraction, multiplication, or division as appropriate.

Science TEKS:  4.2(A) plan and implement descriptive investigations, including asking well defined questions, making inferences, and selecting and using appropriate equipment or technology to answer his/her questions;  Scientific Investigation and Reasoning:  The student uses critical thinking and scientific problem solving to make informed decisions;  4.4 (B) make informed choices in the use and conservation of natural resources and reusing and recycling of materials such as paper, aluminum, glass, cans, and plastic.;  4.4(A) collect, record, and analyze information using tools, including calculators, microscopes, cameras, computers, hand lenses, metric rulers, meter sticks, notebooks, timing devices; and materials to support observations;  4.6(A) Force, Motion, and Energy: differentiate among forms of energy, including mechanical, sound, electrical, light, and thermal;

Technology TEKS:  4.4(A) Critical Thinking, Problem Solving, and Decision Making. The student researches and evaluates projects using digital tools and resources. The student is expected to:  4.4(B) collect, analyze, and represent data to solve problems using tools such as word processing, databases, spreadsheets, graphic organizers, charts, multimedia, simulations, models, and programming languages;  4.6(A) Technology Operations and Concepts: The student demonstrates knowledge and appropriate use of technology systems, concepts, and operations. The student is expected to demonstrate an understanding of technology concepts, including terminology for the use of operating systems, network systems, virtual systems, and learning systems appropriate for Grades 3-5 learning.

Brief Summary:

The book is a story about a shy little girl named, Rosie Revere, who dreams daily about becoming an engineer through exploring the world around her. The story is unique in that the character Rosie, uses recycled products found in everyday life to bring relevant, useful inventions into reality. What some may view as trash to be hastily abandoned in heaps, Rosie identifies as treasures to add to her trove of engineering gadgets and gizmos! Initially, Rosie had not always been shy and apprehensive about her inventions;
however, one day when she had created a hat for a beloved zookeeper, she did not receive the approving reaction she expected and instead received what she felt as condescending ridicule! This unexpected response shattered Rosie’s engineering dreams and forced her to discontinue sharing her inventions, opting instead to clandestinely create in silence. Her bravery returned one day, when her dear great-great aunt Rose shared her lifelong dream of flying! Rosie worked tirelessly to make her aunt’s dream into a reality.

Although she worked night and day to invent and an aeronautical creation, in Rosie’s eyes she had failed because it never sustained flight long enough to be considered a success. Her worst fears were confirmed when she heard her Aunt’s laughter as she tried to fly it. Misconstrued again as ridicule, Rosie rushed to run away, only to be comforted and congratulated by her great-great Aunt Rosie for “the perfect first try!”

In the end, Rosie and her aunt continued to work together to perfect the invention. The moral of the story: “The only true failure can come if you quit.”

Materials needed:

“Rosie Revere, Engineer,” foam airplane kit, wooden airplane kit, notebook paper, tape, glue, construction paper, crayons/map colors, pencils, measuring tape/ruler, paperclip, Airplane Student Recording Sheet, Excel/Google Docs Spreadsheet (Interactive Teacher Created PowerPoint, Plicker Cards, student recycled materials optional.)

Suggested Activity:

Introduce the STEM Lesson with the read-aloud, “Rosie Revere, Engineer.”

Ask thought-provoking questions to stimulate critical thinking and problem-solving skills. Allow student discussion within cooperative groups to generate thinking and provide opportunity for collaborative feedback, rationale, and reasoning.

Begin the experiential portion of the lesson with a formative assessment, allowing students time to assist with completing the K of their KWL chart.

After students record and share their ideas with the class, engage students by showing "World Record Paper Airplane Distance," a one-minute video of the current world record holder for longest paper airplane flight.

As a class, discuss the topics and ideas that the students would need to know or like to know regarding successful paper airplane design. (As students share ideas, the teacher should have the students add these to their "What I Want to Learn" column on the KWL Chart.)

Step I: Investigating
1. Students will be given a sheet of paper and be instructed to make a paper airplane. They may not cut, glue or draw on the paper during construction. (Students may also work with a partner depending on the needs of your students.)

2. If students have limited experience with paper airplanes, they may follow the step-by-step directions for making a basic dart airplane at Amazing Paper Airplanes.

3. Allow students to select materials for creating their paper airplanes. Next, provide time for them to create their airplane. (Sample instructions are provided if needed.)

**Paper Airplane DIY**

1). Fold the paper in half vertically.  
2). Unfold the paper and fold each of the top corners into the center line.  
3). Fold the top edges into the center line.  
4). Fold the plane in half toward you.  
5). Fold the wings down, matching the top edges up with the bottom edge of the body.  
6). Add glue or tape to the inside of the body.

4. Students should complete “Step 1: Investigating,” on the student recording sheet during this phase of the lesson.

5. After all students have folded their airplane, the teacher should allow exploration time for students to investigate the effects of gravity on their airplanes.

(The purpose for this phase of the lesson will be for students to observe and take note of how this design of airplane performs and how gravity is affecting its performance.)

6. Students may record their observations and complete their hypothesis about which airplane will travel or “fly” the farthest.

**Step II: Planning**

Student should complete the Planning portion of the recording sheet.

- Depending on the teacher’s group of students, reviewing procedures for this portion of the lesson may be beneficial and could include the following:  
- Students should be standing at a designated throw/release line when sending their airplanes into flight. Students should never be throwing the airplanes at each other or back-and-forth.  
- Students should be practicing a reasonable throw during this time, not too hard and not too soft. Discuss and decide this as a class.  
- Students should be measuring to the nearest whole foot and inch when using their measuring tools.
To reinforce accurate measuring the teacher may ask the following:
- Are you taking your measurement in the straightest line possible?
- Are you starting at the designated throw line each time you measure?
- Are you ensuring you're throwing from the designated throw line to ensure your measurements are accurate?
- Are you ensuring that you are using your measurement tool correctly?
- Why do you think it is important to have a starting throw line?

7. Encourage students to add to the L column of their KWL charts as they progress through the lesson. If they can now answer or add to ideas/topics that were written into the W column of their charts, they should do so.

8. Students will now complete the experiment by testing each airplane. They will record the throws on the Flight-Testing Tables located of their Airplane Recording Sheet.

9. After that, students will manually find the average distance of each plane using the formula provided. They will use the electronic spreadsheet to record their information and to double check their finds with technology integration.

**Step III: Analyzing the Results**
Students will reflect and analyze the results. Finally, students will form conclusions and defend their findings.

**Critical-Thinking Questions:**

**Higher Level:**
- How did you prove or disprove your hypothesis?
- What effect does estimation have on your experiment?
- Look at each airplane and decide which airplane would be the most beneficial to our environment. Why did you select this airplane? Support your answer with evidence from the experiment.

**Medium Level:**
- Which airplane will be the most beneficial to our earth?
- How can the design of a paper airplane be altered to maximize the distance the plane will fly?
- Does forming a hypothesis help an experiment?

**Lower Level**
- What is the difference between each type of airplane?
- How can using a paper airplane help the environment?
- Do you think the weight will affect the distance?
References:

https://www.diynetwork.com/made-and-remade/learn-it/5-basic-paper-airplanes

https://www.cpalms.org/Public/PreviewResourceLesson/Preview/34337

https://safeshare.tv/x/ixZHvEerXX

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