Sheep in a Jeep

I. Engage
   a. As you read the book *Sheep in a Jeep* to your students, tell them to give you a thumbs-up (or any other cue) when they think they hear an example of a *force* or a *motion* in the book—determine student prior knowledge.
   b. Make a T-chart on the board or on chart paper. Label one side "Force" and the other side "Motion". Discuss students' ideas of force and motion and list them on the T-chart. Also ask students to name examples of force and motion from the book.

II. Explore
   a. Students will explore and experiment with the force and motion of a sheep in a jeep.
   b. Students will first set up a ramp (approximately 5 cm high—with a stack of books) and identify the force that caused the jeep to move up the ramp and what force caused the jeep to roll down the ramp.
   c. Students will experiment with the height of the ramp. First, they will test how far the jeep will roll from the end of the ramp if the ramp is 5 cm high. The students will do three trials and take the average. Then the students will change the ramp height to 10 cm and test three more trials and take the average. Students should record and analyze their data (see the Checkpoint Lab sheets)
   d. Keeping the ramp at 5 cm high, students will investigate how different surfaces affect the motion of the jeep. For each surface they test, students will need to measure how far the jeep will roll from the end of the ramp. The students will do three trials and take the average. Students should record and analyze their data (see the Checkpoint Lab sheets)
   e. Students can also test what happens to the sheep in the jeep when it hits a "tree" like in the book. This leads to a good discussion on inertia.

III. Explain
   a. Students make a poster with their team displaying what they learned about forces and motion from the Explore section.
   b. The poster should include important information learned from each experiment, data tables and/or graphs, sketches, etc.

IV. Explore & Explain

a. Open sort: Distribute a set of Motion and Forces Sentence Cards to each pair of students for an open sort. Instruct students to make sentences with the cards. As you move from pair to pair, ask students to explain the meaning of their sentences.
b. Pair Read & Closed Sort: Have student pairs read the "Motion and Forces" article. Provide categories into which students are to assign words. In this case, the categories come from the bold words in the article: *force*, *motion*, *inertia*, *gravity*, and *friction*. Students can now make new sentences based on the information they read in the article. Ask students to justify their new sentences with evidence from the article as you move around to each team.

V. Sheep in a Jeep Challenge
a. Riding in a jeep can be dangerous for sheep! Because of forces like inertia and gravity, the sheep roll down the hill, hit a tree, and get thrown from the jeep. The sheep must leap from the jeep, but how can they keep from getting hurt? You and your team of physicists must design, create, and improve a device that will slow down the fall of the sheep when they leap. You must test your device with one sheep using your device and another sheep without your device. Which sheep will survive the leap from the jeep?
b. Student should explain how their solution works, they should improve their prototype, and sketch a blueprint of their best solution.