

Lesson Focus: K'Nex Car Competition (Phases 1-2)

Time: 40 min for build and trials, 20 min for competition

Guiding Question, Course/Grade Level Expectations, and SPI's are included for 6th, 7th, and 8th grade Math and Science, Physical Science, Biology, Physics, Algebra 1, Algebra 2, and Geometry. (**See the Standards Spreadsheet**)

Materials: (for each group)

K'Nex Forces, Energy, and Motion Set with schematics

[Data Sheet](#)

Plastic cup

Pennies (to be used as cargo)

Journal

Testing area: Colored tape to mark start and finish lines

Measuring Tape (or use floor tiles to measure to the nearest block)

Preparing the lesson:

1. Divide students into small groups. (4-5 students)
2. Provide K'Nex Set to each group.
3. Set up Testing Area (You will need a 25 feet area for racetrack, perhaps in a hallway. Use colored tape to mark a starting line and the target "block.")

Teaching the Lesson:

1. Discuss the difference between NEEDS and WANTS. Get a better design by meeting the design NEEDS first, then make modifications to add the WANTS. Do not sacrifice the functionality of the design by adding nonessential features. For example, since speed is not a factor for this contest, it is not necessary to try to make the vehicle go the fastest.

NEED – vehicle MUST be able to do this

WANT – vehicle may do this at varying levels

(Try to create a design that will do these things best.)

For example, if we consider that you are planning on buying a car,

Your NEEDS would be that it be able to get you back and forth from where you want to go

And that it would run on readily available fuel.

2. Present the competition rules, as follows:

- Build a vehicle having your own design. It does not have to be like any of the vehicles in the K'Nex book.
- You may NOT use the plastic bag or rubber bands.
- It must be powered by one or more spring motor(s).
- It must have only parts from the kit you were given.
- Your vehicle will be required to carry a cargo of pennies over the course. (More pennies = higher score)
- The course your vehicle will travel will be a straight-line course of 24 feet in length.
- Your goal is to travel the exact distance using only the motive power provided by your motor(s) without losing any of your cargo (the pennies).

- You may wind your motor(s) at the starting line, only.
- Only the number of pennies on board at the completion of the run will count.
- The judgment of the officials will be final.
- Experiment with your vehicle and collect the following data:

of Pennies, Distance retracted, Distance traveled

Distance retracted(ft) vs. Distance traveled(ft)

of pennies vs. Distance traveled(ft)

- Create 2 graphs:

Distance retracted(ft) vs. Distance traveled(ft)

of pennies vs. Distance traveled(ft)

- Use your graphs to determine the best strategy to complete the task.

Assessment (Phase 1): Calculate each team's score by using the following formula: $(50 * \text{\# of pennies} / \text{Max pennies by any group}) + (50 * \text{Min distance missed by any group} / \text{distance this car missed})$. Award points for 1st place through last place with lowest score having higher rank.

Extension: Have students plan and present a technical presentation. (See Technical Presentation Lesson Plan for criteria and grading rubric.)

AND/OR

Phase 2 Competition:

Students revise the model to improve their car's performance.

Repeat the contest above with the same rules except that the amount of cargo carried will be divided by the number of motors used.

Assessment (Phase 2): Calculate each team's score by using the following formula: $((100 * \text{\#of pennies} / \text{\# of motors}) / \text{Max pennies by any group}) + (100 * \text{Min distance missed by any group} / \text{distance this car missed})$. Award points for 1st place through last place with lowest score having higher rank.

Journal Writing: Have students reflect on their method(s) of problem solving and communicating. How could they have improved their methods, communication, and accuracy?