



As the Ferris Wheel Turns



45-minute sessions

Curriculum Connections

Technology, Science, Math

Objectives

Students will:

- use available technology to solve a problem
- explore efficient ways of moving people to save time and money
- engage in creative problem solving and building

Materials

K'NEX Ferris Wheel

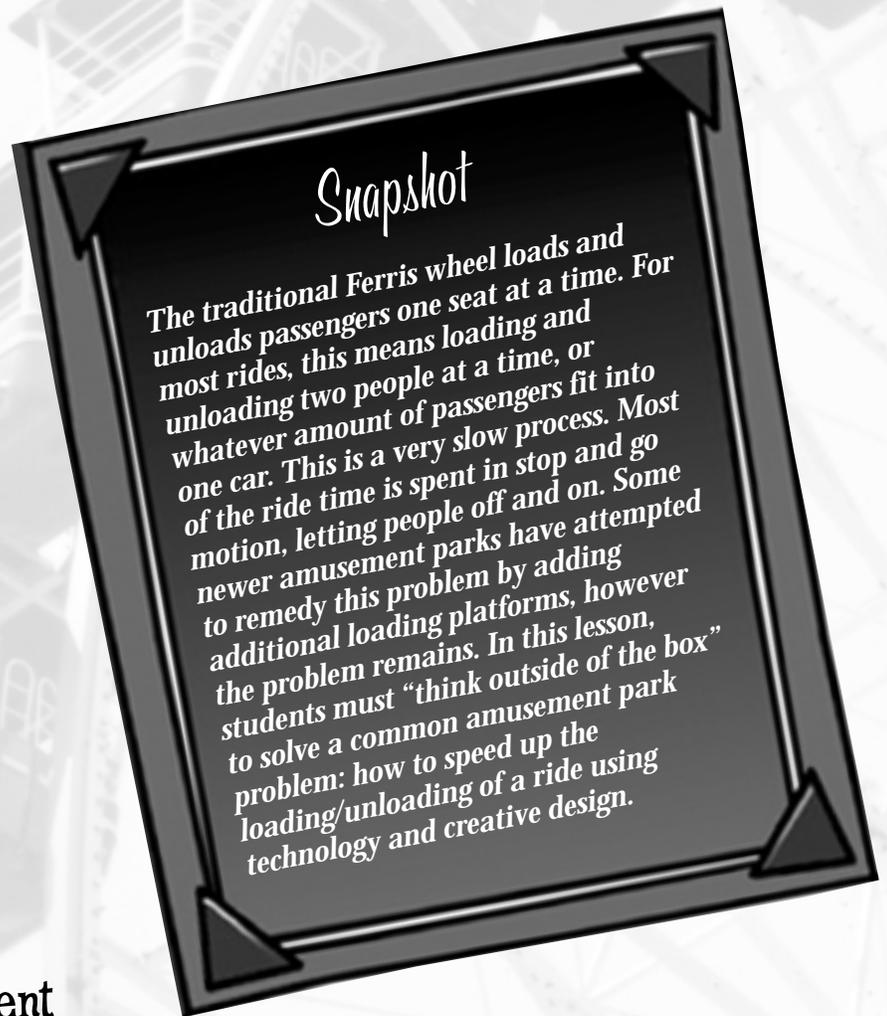
Extra K'NEX pieces

Toy figures

CAD software program (optional)

Assorted building materials

Worksheet – Measure It



Concept Development

The Ferris wheel takes a very long time to load and unload because traditionally, it happens one car at a time. Some riders consider this procedure part of the Ferris wheel experience. Other riders would prefer to spend more time in the actual circular motion of the Ferris wheel ride. To do this, there has to be a method for loading and unloading passengers more than one car at a time. The role of a ride designer is to find creative and safe methods to solve this problem. While doing this, they must also consider whether the changes they make are cost effective, based on the amount of money the ride costs to operate and the profit that it brings in for the park. Often the most obscure ideas can be modified into money and time saving solutions.



Safety Concerns

None

Concept Investigations/Demonstration

To help the students understand a Ferris wheel's loading/unloading problem, have them complete the following exercise that simulates the process.

1. Either outside or in an open room, mark off a large circle. Use traffic cones, chairs, or tape to signify the entrance or loading zone.
2. Line the students up at the entrance. Explain that this ride consists of students walking slowly around the circle, keeping an equal distance from each other.
3. Have one student admit the passengers to the ride. As each student moves on the circle, stop the ride and position him or her correctly. Hand each person a piece of paper with the loading number and time written on it. Start the ride again until the next student gets on.
This will result in a very long, jerky loading process as the students walk two or three steps, stop, position a new person, and start the ride again for a few steps.
4. After placing everyone, allow the students to walk around continuously for one minute. Remember that this ride is slow and methodical. Students remain an equal distance apart.
5. Reverse the loading procedure until everyone is off the ride. Begin with the student that entered first. As the students disembark, have them write down the time on their time card.
6. Ask the students to do the math to find out how long they were involved in the loading/unloading procedure as opposed to the one minute of constant motion.

Discussion

Discuss the differences between the loading/unloading portions of the ride as compared to the smooth, non-stop part of the ride. Have students think about why the loading/unloading procedure was such a time consuming process. Draw their attention to the K'NEX Ferris Wheel and the similar problems it has with loading/unloading its passengers. Brainstorm a list of suggestions to remedy this problem. Encourage students to think creatively about solutions to this problem. No solution is too unrealistic. Some suggestions may include multiple loading stations, separate loading and unloading stations, raised loading platforms and continuous loading belts. List the students' ideas on the blackboard.



Activity

1. Have students observe the rotation of the Ferris Wheel and relate it to the previous activity. Students should simulate a ride, timing loading and unloading each of the sixteen cars and allow one minute of uninterrupted motion.
2. Have the students take actual measurements of the K'NEX Ferris Wheel so that they can establish a scale drawing. Record the information on the "Measure It" worksheet. Required measurements include:
 - height and diameter of wheel
 - height of support towers
 - width of space between towers
 - number of seats
 - distance between seats
 - distance from ground to seat
3. Tell students to select one of the methods for solving the loading/unloading problem from the brainstormed list or use another idea of their own. Have them plan the design on paper, using their measurements to make the drawing to scale. Students with access to and knowledge of CAD software can plan their design on the computer.
4. Students should provide an explanation in their Park Handbooks for how their design will solve the loading/unloading problem. They should also explain how their solution would operate.
5. Using K'NEX and other materials, allow students to build a working model of their design. Remind them that they may not be able to build the model exactly according to their design due to availability of materials or time. Encourage them to make necessary modifications. They should discuss these issues in their Park Handbooks with a description of how they changed their design and why.
6. Instruct students to estimate the time savings for the ride. They should also describe how the time savings would lead to greater income and/or ride enjoyment.

Verbalization



Have the students display and explain their solution to the class. Conduct a question and answer period where the students explain how their design works and solves the problem. Simulate a ride using the K'NEX Ferris Wheel and the new loading system. Have students compare ride times and how their design solves the problem and saves time in the loading/unloading process.

Assessment

Allow the class to assess the design based on whether it allows the passengers to experience a shortened loading/unloading procedure and longer continuous ride. They can also grade the design on a scale of 1-5 for how it fulfills the following criteria:

- uses technology to solve the problem
- is a realistic solution when considering cost and time to build
- can be easily built and adapted to fit the Ferris Wheel
- will add to the enjoyment of the ride



Cleanup

Reassemble the K'NEX Ferris Wheel to its original design.

Extensions

Have students determine the cost for building their addition to the Ferris Wheel based on the “What Does It Cost?” lesson. Have them calculate how much to charge for the ride and how many riders they must have per day to pay for the cost of the addition within a year’s time. Have students set up a payment schedule with options based on different ride costs and number of riders per days of operation within a year.

Enrichment

Using the Internet, investigate Ferris wheel manufacturers and determine if new loading designs are being considered or are now available. Discuss the safety concerns that must be considered whenever a new loading design is offered.

Check out these websites to see new and exciting designs.

<http://www.elibridge.com> Eli Bridge Company, United States

<http://www.peterjohnson.co.uk/index.htm> Peter Johnson Company, United Kingdom

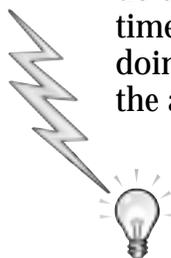
<http://213.196.27.24/overview.asp> Nauta-Bussink Company, Switzerland



ACTIVITY SHEET As the Ferris Wheel Turns

Background

The Ferris wheel takes a very long time to load and unload because traditionally, it happens one car at a time. Some riders consider this procedure part of the Ferris wheel experience. Other riders would prefer to spend more time in the actual circular motion of the Ferris wheel ride. To do this, there has to be a method for loading and unloading passengers more than one car at a time. The role of a ride designer is to find creative and safe methods to solve this problem. While doing this, they must also consider whether the changes they make are cost effective, based on the amount of money the ride costs to operate and the profit that it brings in for the park. Often the most obscure ideas can be modified into money and time saving solutions.



Think About It

Using the K'NEX Ferris Wheel, simulate a ride, timing loading and unloading each of the sixteen cars and allowing a minute of uninterrupted motion. K'NEX riders or toy figures can be used as passengers. Keep an accurate accounting of each procedure.

In your Park Handbook, compare the loading/unloading portions of the ride to the smooth, non-stop part of the ride. Which took longer? Which was probably more enjoyable for the passengers? Why was the loading/unloading procedure so time consuming? How can those procedures be shortened?

Brainstorm a list of suggestions for remedying this problem. Think creatively about solutions to this problem. No solution is too unrealistic.



As the Ferris Wheel Turns

ACTIVITY SHEET

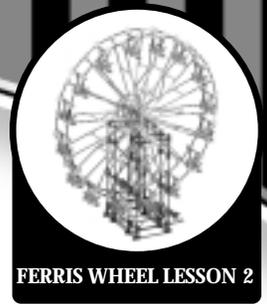
Test It



1. Measure the K'NEX Ferris Wheel to establish a scale. Record the information on the "Measure It" worksheet. Measure the following:
 - height and diameter of wheel
 - height of support towers
 - width of space between towers
 - number of seats
 - distance between seats
 - distance from ground to seat
2. Select one of the methods for solving the loading/unloading problem from the brainstormed list or use another idea of your own. Plan your design on paper; draw a scale model of the redesigned Ferris Wheel. If you have access to and knowledge of CAD software, plan your design on the computer.
3. Provide an explanation in your Park Handbook of how your design will solve the loading/unloading problem. Explain how your solution will operate.
4. Using K'NEX and other materials, build a working model of your design. Remember, you may not be able to build the model exactly according to your design due to the availability of materials or time. Make necessary modifications.
5. Discuss these issues in your Park Handbook with a description of how you had to change the design and why.
6. Estimate the time savings your design will cause. Describe how the time savings will lead to greater income and/or ride enjoyment.

Review It

Display and explain your solution to the class. Answer questions to explain how your design works and how it solves the problem. Simulate a ride using the K'NEX Ferris Wheel and the new loading system. Compare ride times and how your design solves the problem and saves time in the loading/unloading process.



Measure It

WORKSHEET

Measure the K'NEX Ferris Wheel and create a scale you will use when designing the solution to the loading/unloading problem.

Scale: _____ cm = _____ m

	Actual measurements	Scale measurements
1. height of wheel from ground to top		
2. diameter of wheel		
3. height of support towers		
4. width of space between towers		
5. width of seats		
6. distance between the seats		
7. distance from ground to lowest seat		
8. number of seats		

