Lesson 3 Swing Ride

Context:

Now it is time to get to work on one of the rides that will be a part of the amusement park. Your team has finished the Amusement Park Gateway and is ready to begin work on the Swing Ride. This ride will be a favorite of both children and adults alike.

Follow directions, plan your programs carefully, and complete the activities for the Swing Ride.

Requirements:

For this activity you are required to:

1. Make daily entries in your STEM Journal.
   (Teacher Note: Help students to realize the importance of keeping records and journaling. Inform students of the materials they must include in their STEM Journals.)
2. List the K'NEXions Chart for all Challenge Activities your team completes.
   (Teacher Note: If you are using the simplified Program Presentation Sheet, the K'NEXions Chart will be at the top of that sheet. If not, a template page for K'NEXions Charts has been provided.)
3. List and describe the steps in your programs. Keep a record of changes you made to programs as you improved them.
   (Teacher Note: The simplified Program Presentation Sheet will help students with limited writing skills to describe their program in a graphic as well as a written form. Students with better writing skills can list and describe their programs directly in their STEM Journals.)
4. Include all calculations, charts, and graphs you prepare in your STEM Journal.

Objectives:

The students will demonstrate the ability to:

- ☑ Use logical thinking skills to program the Swing Ride to effectively use a buzzer, motor and LED to design an exciting ride.
  (Science and Technology)
- ☑ Design programs for the Swing Ride that meet stated needs.
  (Science and Technology)
- ☑ Collect, organize, and display relevant data to answer questions.
  (Science, Engineering, and Mathematics)
- ☑ Report on the concept of inertia and describe how it influences the operation of the Swing Ride.
  (Science)
- ☑ Solve problems related to rotational motion.
  (Science and Mathematics)

Have students open the Swing Ride SCE.

Construction:

Use the instructions to build the K'NEX Swing Ride model.
(Technology and Engineering)

Ensure that all of the electronic components have been connected to the K'NEX Control Box before you begin work.

(The K'NEXions Chart outlines the placement of the buzzer, motor, and LEDs for the Learning Tasks in this lesson. The students will find this information in graphic form in the building instructions.)

K'NEXions Chart

K'NEX Swing Ride

Output	Device
1	
2	
3	LED
4	BUZZER
A	MOTOR
B	

Learning Tasks:

Complete these learning tasks using both the Swing Ride SCE on the computer and the K'NEX Swing Ride model and Control Box.
(Teacher Note: Encourage students to complete these learning tasks using the Swing Ride SCE on the computer before they program the Control Box to operate the K'NEX model.)

Write programs to make the K'NEX Swing Ride complete the tasks below.

1. * **Write a program for the Control Box to make the Swing Ride change direction three times. Allow the Control Box to repeat your program several times.**
   (Science and Technology)

2. * **Write a program for the Control Box to make the model:**
   a. Change direction three times and spin for 10 seconds in each direction,
   b. Stop for five seconds between direction changes.
   c. Repeat your program several times.
   (Science, Technology, and Mathematics)

3. * * **Write a program for the Control Box to add the LED and Buzzer to improve the safety of the ride for the riders and observers. Your team may decide how the ride will operate. Allow the Control Box to repeat your program several times.**
   (Science, Technology, and Engineering)

Challenge Activities:

Keep daily notes in your STEM Journal and include all of the programs you write.
(Teacher Note: Remind students that the output devices may need to be plugged into different locations on the Control Box for Challenge Activities.)

1. ** **Write a single program for the Control Box so:**
   a. The LED shines red when the ride is moving clockwise.
   b. The LED shines green when the ride is moving counterclockwise.
   c. Allow the Control Box to repeat your program several times.
   (Hint: you may need to plug the LED into a different location on the Control Box and remove the buzzer.)
   (Science and Technology)

2. * **Determine the speed of the K'NEX Swing Ride in revolutions per minute (rpm). In other words, how many times does the ride spin in one minute?**
   (Science and Mathematics)

3. ** **Find the average speed of the K'NEX Swing Ride in revolutions per minute (rpm) for a total of four (4), one-minute trials.**
   a. Collect the data and design a data chart to display the data.
   b. Find the average of the four (4) sets of data.
   c. Show all calculations in your STEM Journal.
   d. Be prepared to explain your experimental strategy and to demonstrate how you arrived at your answer.
   (Note: You may place a masking tape flag on one seat of the ride to make counting easier.) (Science and Mathematics)

4. * **Operate the ride for several minutes as you observe the motion of the seats. Start and stop the ride several times:**
   a. What do you observe about the seats when the ride speeds up?
   b. What do you observe about the seats as the ride moves at a constant speed?
   c. What do you observe about the seats when the ride slows?
   d. Provide one or more explanations for what you observed.
   (Science, Technology, Engineering and Mathematics)

5. ** **Research the word inertia.**

   a. Describe how this model overcomes inertia in paragraph form.

   b. How is the concept of inertia demonstrated by this model?
   (Science, Technology, Engineering and Mathematics)

6. ** **The seats on the K'NEX Swing Ride are attached to the ride with long gray Rods. Remove the gray Rods and replace them with yellow Rods.**

   a. Find the average speed of the modified K'NEX Swing Ride in revolutions per minute (rpm) for a total of four (4), one-minute trials.

   b. Compare your findings with the results you calculated for the original K'NEX Swing Ride.

   c. Explain any differences you find in paragraph form.
   (Science, Technology, Engineering and Mathematics)

7. * **Refer to the building instructions for the K'NEX Swing Ride and the Cost per Piece Chart provided by your teacher. Determine the cost of the materials that are used to build the ride.**

   a. Make a data chart for this activity in your STEM Journal and include all of your calculations

   b. Place your answer on the board in the spot indicated by your teacher.
   (Teacher Note: Set aside space on the white board or chalk board for each team to list their cost of materials so that the costs are visible to the entire class.).

   c. How do your results compare with other groups who have completed the challenge? If answers vary, devise and implement a plan to check your work.
   (Teacher Note: Provide time for the teams to compare their answers and to correct any differences. The Cost Per Piece Chart has been provided in an editable format allowing you to assign costs to the K'NEX Pieces that are appropriate for the students you are working with.
   (Science, Engineering, and Mathematics)

8. ** **Complete the activity above using a spreadsheet program to organize the data, compute the costs, and calculate the total cost of the materials used to build the K'NEX Swing Ride.**
   (Science, Technology, Engineering, and Mathematics)