STEM Collaborative Cataloging Project

[SkyRail Roller Coasters]Lesson Plan

Context (InTASC 1,2,3)

Lesson Plan Created By: Shelby Strand
Created:
Lesson Topic: Potential and Kinetic Energy
Grade Level: Grade 4
Duration: 2-5 days depending on time
Kit Contents: http://odin-primo.hosted.exlibrisgroup.com/nmy:nmy_all:ODIN_ALEPH007736584

Desired Results (InTASC 4)

Purpose: The purpose of this activity is to provide an experience for students to experiment with potential and kinetic energy.

North Dakota English Language Arts & Literacy Content Standards:

- Speaking and Listening Standards: Presentation of Knowledge and Ideas
  - SL.4 (Grade 4) Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant descriptive details to support main ideas or themes, speaking clearly at an understandable pace.

North Dakota Science Content Standards

- Science Standards: Energy
  - PS 3.1 (Grade 4) Use evidence to construct an explanation relating the speed of an object to the energy of that object.
  - PS 3.4 (Grade 4) Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Objectives:

The students will be able to:

1. Communicate and cooperate with classmates before, during, and after construction.
2. Identify where there is potential energy and kinetic energy in the roller coaster
3. Trouble shoot during the building process, and make modifications to the track to get the marble to stop at the end of the track.

Assessment Evidence (InTASC 6)

Evidence of meeting desired results: It will be evident that the students have met expectations based upon if their roller coasters are able to stop their marble at the end of their track and stay within the constraints set by the teacher. Their drawn sheets will be a formal formative assessment of their understanding of potential and kinetic energy. The end discussion and comparison of their final roller coaster to the original will be an assessment of why they made the changes they did and how they apply to kinetic and potential energy. Vocabulary will be assessed during discussions.

Learning Plan (InTASC 4,5,7,8)

Instructional Strategy: (Check all that apply)

☑ Direct ☐ Indirect ☑ Independent ☑ Experiential ☑ Interactive

Technology Use(s): (Check all that apply)

☐ Student Interaction ☐ Align Goals ☐ Differentiate Instruction ☑ Enhance Lesson

☐ Collect Data ☐ N/A

Hook and Hold:

- When you begin, play the GoNoodle video "Roller Coaster" and have the kids do all of the actions. During the video point out when you have the most potential energy and when the kinetic energy takes over. You can find this video on YouTube by searching GoNoodle Roller Coaster. After you have safely finished your roller coaster ride, explain to the students that today they need to design a roller coaster that safely gets their passengers (a marble) to the end without crashing.

Materials:

- Skyrail Roller coaster kit
- Tape
- Paper and Pencils
- Active Board
- Computer
- Any other materials to stabilize the track (books, classroom furniture, etc.)

Procedures:

1. Review the ideas of kinetic and potential energy. Check for understanding that potential energy is stored and kinetic energy is that of motion. Split the students up into groups of 3-4 in size. Each group should get a skyrail coaster kit.
2. Before they begin setting up, explain to them that the main objective is to get the marble to stop at the end of the track and not fly off. This will indicate that the kinetic and potential energy are mostly balanced.
3. They also have to have at least one loop in their coaster and can only use the track that came with their kit. It can be up to the teacher if they will be allowed to use tape and any furniture to attach their track to.
4. Let the students design their plan on a piece of paper before they begin. Have them indicate where the potential energy is and where kinetic energy is present.
5. This piece of paper will be handed in to the teacher before they begin building. Once you have a group's paper they may start constructing their coaster.
6. This will be mostly independent group work with very little help from the teacher. It will take them several days to get their marble to come to a complete stop at the end of the track depending on how much time each day you set aside for this activity.
7. When the first group gets their marble to stop three consecutive times on their track they are declared done. As soon as the first group finishes each remaining group has one more day to get their roller coasters to stop their marble

Summary: After each group gets their marble to stop or by the last day even if they haven't, hand back their sheets with their initial drawings on them. Allow each group some time to compare their initial drawing to their final product. Discuss what changes were made (if any) and why they were made. Have each group discuss their modifications and results with the entire group. They should include what they would change if they could do this again

Reflection (InTASC 9)

Reflect On:

- *Preparation*
- *Planning*
- *Teaching*
- *Student Engagement and Participation*
- *Evidence of Student Learning*

Standards

Council of Chief School Officers. (2011, April) *Interstate Teacher Assessment and Support Consortium (InTASC) model core teaching standards: a resource for state dialogue*. Washington DC. Retrieved from http://www.ccsso.org/documents/2011/intasc_model_core_teaching_standards_2011.pdf

North Dakota Department of Public Instruction. (2011) *North Dakota English language arts & literacy content standards.* Bismarck, ND. Retrieved from https://www.nd.gov/dpi/uploads/87/ELA_JUN0811.pdf

North Dakota Department of Public Instruction. (2014) *North Dakota science content standards.* Bismarck, ND. Retrieved from https://www.nd.gov/dpi/uploads/132/NDScienceStandardsDraftFormat2_FourthGrade.pdf

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