**Engineering A: Engineering Design Process**

**Introduction to Engineering Design Process (Parent Lesson)**

**Idaho Content Standards- Science (ICSS):**

* n/a

**Math Common Core State Standards (Math-CCSS):**

* n/a

**Next Generation Science Standards (NGSS):**

* 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraint on materials, time, or cost.

**English Language Arts Common Core State Standards (ELA-CCSS):**

* SL.5.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-lead) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.
* SL.5.1.B Follow agreed-upon rules for discussions and carry out assigned roles.
* SL.5.1.C Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
* SL.5.1.D Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.
* SL.5.4 Report on a topic or text or present an opinion sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

**Eggbert**

**ICSS:**

* PS1-4-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object.
* PS1-4-3 Ask questions to predict outcomes about the changes in energy that occur when objects collide.
* PS2-5-1 Support an argument that the gravitational force exerted by Earth on objects is directed down.
* PS2-MS-1 Apply Newton’s Third Law to design a solution to a problem involving the motion of two colliding objects.
* PS2-MS-2 Plan an investigation to provide evidence that the change in an object’s motion depends on the sum of forces on the object and the mass of the object.
* PF3-MS-5 Construct, use, and present arguments to support the claim that when kinetic energy of an object changes, energy is transferred to or from the object.

**Math-CCSS:**

* 4.OA.A.1 Interpret a multiplication equation as a comparison.
* 4.NBT.A.3 Fluently add and subtract multi-digit whole numbers using the standard algorithm.
* 5.NBT.B.5 Fluently multiply multi-digit whole numbers using the standard algorithm.

**NGSS:**

* 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraint on materials, time, or cost.
* 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
* 3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
* 4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.
* 4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide.
* 5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.
* MS-PS2-1 Apply Newton’s Third Law to design a solution to a problem involving the motion of two colliding objects.
* MS-PS2-2 Plan an investigation to provide evidence that the change in an object’s motion depends on the sum of forces on the object and the mass of the object.

**ELA-CCSS:**

* SL.5.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-lead) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.
* SL.5.1.B Follow agreed-upon rules for discussions and carry out assigned roles.
* SL.5.1.C Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
* SL.5.1.D Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.
* SL.5.4 Report on a topic or text or present an opinion sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

**Operation Bridge Quest**

**ICSS:**

* n/a

**Math-CCSS:**

* n/a

**NGSS:**

* 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraint on materials, time, or cost.
* 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
* 3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**ELA-CCSS:**

* RF.5.3 Know and apply grade-level phonics and word analysis skills in decoding words.
* RF.5.3.A Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context.
* RF.5.4 Read with sufficient accuracy and fluency to support comprehension.
* RF.5.4.A Read on-level text with purpose and understanding.
* SL.5.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-lead) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.
* SL.5.1.B Follow agreed-upon rules for discussions and carry out assigned roles.
* SL.5.1.C Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
* SL.5.1.D Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.
* SL.5.4 Report on a topic or text or present an opinion sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.
* L.5.4 Determine or clarify the meaning of unknown and multiple-meaning words, and phrases choosing flexibly from a range of strategies.

**Contraption Action!**

**ICSS:**

* PS2-5-1 Support an argument that the gravitational force exerted by Earth on objects is directed down.
* PS3-MS-5 Construct, use, and present arguments to support the claim that when kinetic energy of an object changes, energy is transferred to or from the object.

**Math-CCSS:**

* n/a

**NGSS:**

* 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraint on materials, time, or cost.
* 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
* 3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
* 4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.
* 4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide.
* 4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
* 5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.

**ELA-CCSS:**

* SL.5.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-lead) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.
* SL.5.1.B Follow agreed-upon rules for discussions and carry out assigned roles.
* SL.5.1.C Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
* SL.5.1.D Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.
* SL.5.4 Report on a topic or text or present an opinion sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

**Sphero Solutions**

**ICSS:**

* PS1-4-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object.
* PS1-4-3 Ask questions to predict outcomes about the changes in energy that occur when objects collide.
* PS2-5-1 Support an argument that the gravitational force exerted by Earth on objects is directed down.
* PS2-MS-1 Apply Newton’s Third Law to design a solution to a problem involving the motion of two colliding objects.
* PS2-MS-2 Plan an investigation to provide evidence that the change in an object’s motion depends on the sum of forces on the object and the mass of the object.
* PF3-MS-5 Construct, use, and present arguments to support the claim that when kinetic energy of an object changes, energy is transferred to or from the object.

**Math-CCSS:**

* n/a

**NGSS:**

* 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraint on materials, time, or cost.
* 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
* 3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
* 4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.
* 4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide.
* 5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.
* MS-PS2-1 Apply Newton’s Third Law to design a solution to a problem involving the motion of two colliding objects.
* MS-PS2-2 Plan an investigation to provide evidence that the change in an object’s motion depends on the sum of forces on the object and the mass of the object.

**ELA-CCSS:**

* SL.5.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-lead) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.
* SL.5.1.B Follow agreed-upon rules for discussions and carry out assigned roles.
* SL.5.1.C Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
* SL.5.1.D Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.
* SL.5.4 Report on a topic or text or present an opinion sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.