

### Lesson Planning Template

Teacher: Beach	Grade: 7th
Subject: Science/Physics	Topic: Projectile Motion
<p>Brief Lesson Description: Students will build on their prior knowledge of aerodynamic design, force, mass, and acceleration to gain a better understanding of projectile motion. Students will experiment with the Angry Birds game, a real life Angry Bird activity, and will end with a proof of concept projectile device.</p>	
<p>Standards: <b>NC Essential Standards</b>  <b>7.P.1</b> Understand motion, the effects of forces on motion and the graphical representations of motion.  <b>7.P.2</b> Understand forms of energy, energy transfer and transformation and conservation in mechanical systems.</p>	
<p>Learning Goal : Students will apply their knowledge of energy and forces in projectile motion.</p>	
<p>Learning Objective: Given a microworld and creative materials students will be able to analyze and produce their own models to illustrate their understanding of projectile motion.</p>	
<p><b>Narrative / Background Information</b></p>	
<p>Prior Student Knowledge: Students will have a sound understanding of simple machines, Newton’s Laws, mass, acceleration, and force. This activity could be used for physics review.</p>	
<p>Possible Preconceptions/Misconceptions: Students often mistake a trebuchet and catapult for the same device, which should be clarified for students before they begin. Students should be warned ahead of time that not all of Newton’s Laws are accurately reproduced in Angry Birds.</p>	
<p><b>LESSON PLAN – 5-E Model</b></p>	
<p><b>ENGAGE: Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions:</b></p> <p>Students will enter the classroom to the Angry Birds theme being played, and greeted as they enter. Students will participate in class discussion of how we encounter physics in media (movies, television games) and it’s accuracy.</p> <p>Students will read a version of “The Physics of Angry Birds” by Rhett Allain of Wired Magazine (PDF 6 Pages). Some of the later math in this reading is beyond student expectations, but it models and explains how science and math were used to draw their conclusions. Post reading in groups or individually teacher should recap with students.</p>	
<p><b>EXPLORE: Lesson Description – Materials Needed / Probing or Clarifying Questions:</b></p> <p>Students will be setup with shared laptops or similar devices with the Angry Birds game, this is acts as a microworld mindtool. Students may choose to bring their own device but it is recommended to use a class set of devices if available (for access and consistency). The instructor may choose to load a file where all levels have been previously unlocked, this allows students to follow guided practice in a handful of scenarios, however this is not required.</p> <p>Students are given the directions to play the game, but as they are playing be mindful of Newton’s Laws. Students are warned ahead of time that not all of the laws will apply in each level and they are tasked with discovering the anomalies.</p> <p>Instructor may choose to play the Bird Clips video as a guided practice, pausing and allowing students to follow along with the scenes and discover items on their own. The instructor could also leave more time for exploration for the students and use the video as a recap.</p> <p>Note: Consider shared laptops or Tablets/iPads for the best discussion and have students greater lower their sound levels so headphones are not used as these will inhibit discussion.</p>	
<p><b>EXPLAIN: Concepts Explained</b></p> <p>Following class discussion on their observations teacher should share this Angry Birds Video “Birds Clips” (produced by lesson author) <a href="https://www.youtube.com/watch?v=azMUDcG_Gec">https://www.youtube.com/watch?v=azMUDcG_Gec</a></p> <p>Instructor could use one of their own or provide a general explanation in writing to students but having live visuals is a very effective tool.</p> <p>Students will use giant slingshot- this can be easily prepared using a science classroom’s ring stands as uprights and latex tubing from the hardware store. This allows students to see how the actual process compares to the game, and what all would be required to reproduce the projectile motion experienced in the gaming environment. Targets can be setup in the form of printed paper “piggies” from online coloring sheets.</p> <p>Through an analysis and discussion of what works best in their slingshots, students will gain further insight on projectile motion and will</p>	

have the opportunity to revise their design prior to competition.

**ELABORATE: Applications and Extensions:**

Now that students have developed their own concepts students will work in groups to create their own catapults. Materials should be limited to 2 or 3 popsicle sticks, a single plastic spoon, 2 or 3 thumb tacks, and 1 or 2 rubber bands- the projectile will be a simple unaltered ping pong ball. Based on your own students you may choose to add or remove materials but there are many variations of design possible. Student's should be reminded through class discussion how a catapult relates to a lever and how previous concepts gained in the lesson can help them with their design.

**EVALUATE:**

Once student's have completed their designs they will be evaluated not only on the process itself, but they will also complete in a competition. Students can complete in a simple contest on the distance their projectile travels, but a more complex task could also be assigned. It is essential that students are tasked with measuring their own traveled distance to continue to reinforce scientific measurements.

**Elaborate Further / Reflect: Enrichment:**

Tracker <http://physlets.org/tracker/> is free and open source program which students can use to evaluate and complete their own detailed analysis of Angry Birds. This is a wonderful visualization and information interpretation mindtool, but is a complex tool better suited for advanced learners or higher grade levels.

Other games such as Angry Birds Space include different dynamics and could be for further student analysis and enrichment.