

Wizards of Wright

Lesson: Reverse Engineering

Use WOW! Lesson Intro to begin.

<p>Background Info for Wizards:</p>	<p>Reverse Engineering is the process of deconstructing something with the purpose of gaining a better understanding of how it works and potentially improving the design.</p>
<p>Materials:</p>	<p>Guided Lesson: Windup toy to show as an example.</p> <p>Activity #1: Pencil and paper</p> <p>Activity # 2: 1 reverse Engineering worksheet and blank answer grid per team</p> <p>1 simple device to deconstruct</p>
<p>Lesson Time: 45-60 min</p>	<p>Introduction: 2 minutes Guided Lesson: 3 minutes Student Activity # 1: 5-10 minutes Student Activity # 2: 40 minutes (15 to disassemble, 15 to reassemble, 10 min to simplify and discuss) Conclusion: 5 minutes</p>
<p>Learning Targets:</p>	<p>Students will learn about the reverse engineering process and how it serves the progression of science and technology.</p> <p>Students will work as a team to write instructions that will communicate clearly how to re-build a simple device.</p> <p>Students will communicate and brainstorm ideas to simplify their devices.</p>
<p>Introduction for Students: 2 minutes</p>	<p>Reverse Engineering is the process of taking something apart to understand how it works. This process allows engineers to create new products and to improve existing products, and allows you the opportunity to think like an engineer.</p> <p>When engineers (or students) use reverse engineering they can understand how all of the pieces of a device work together. They can use that information to make a new version of the device that may be faster, cheaper, or more environmentally friendly. The reverse engineering process can be applied to anything from toys to computers to even more complicated machines.</p>
<p>Guided Lesson: 3 min</p>	<p>The reverse engineering process begins by thinking about a product or a system and what it does.</p> <p>Show wind-up toy as an example. Explain to students that in order to reverse engineer this toy it would need to be taken apart to understand how it all works,</p>

	<p>and then be put back together - correctly. Sometimes this is when improvements are made.</p> <p>Whether it is this toy, a computer, or a machine the product is taken apart to see all of the individual pieces. Examining the individual parts or steps leads to an understanding of how the parts work in the product. That can show how forces and motion work in general.</p> <p>IMPORTANT: In order to be able to reassemble the product properly an engineer may draw a diagram, take notes, <u>and write out the instructions in reverse</u>. Then another engineer can follow those instructions to re-assemble the device. This process can be challenging! Let's practice.</p>
<p>Student Activity #1: 5-10 minutes</p>	<p>Have students get out a piece of paper and something to write with. Have them list how to build a Peanut Butter and Jelly sandwich <u>in reverse</u>. Have the teacher select one or two students to read theirs to the class.</p>
<p>Student Activity #2: 40 minutes</p> <p><i>15 min. to disassemble</i></p> <p><i>15 min. to reassemble</i></p> <p><i>10 min. to simplify and discuss</i></p>	<p>Students should work in groups of 3-4 to complete this challenge.</p> <p>Explain to students that they will reverse engineer a device, while writing instructions so another group can put it back together.</p> <ol style="list-style-type: none"> 1. Each group will receive a device, a blank instruction sheet, and a blank answer grid. They will have 15 min to deconstruct the device, write instructions, and draw out the answer key. Take a minute to explain how the grid and the layers should be used. <p>They do NOT need to use all the lines given. They should also use the grid to draw an answer key. Suggest that they break the deconstruction process into layers and use the abbreviations noted on the pieces.</p> <ol style="list-style-type: none"> 2. Before the students switch, make sure to collect the answer grids. Each group will leave their directions on the table and move to a different device. 3. Each group will have 15 min to re-construct the new device based only on the instructions. After 10 minutes, any groups that are struggling will be given the answer grid to assist them. 4. The two groups can then discuss what worked and what didn't. The students will then propose a simplified version of each device based off of what they learned in the Reverse Engineering process.

<p>Conclusion: 5 minutes</p>	<p>Collect all the project kits.</p> <p>Reiterate the purpose and utility of the Reverse engineering process.</p> <p>Ask students how this method of problem solving could be applied to their daily lives.</p>
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information and ideas credited to: https://www.teachengineering.org/activities/view/cub_engineering_in_reverse;
<https://kids.britannica.com/kids/article/reverse-engineering/631137>