

Engineering Lesson Plan for 4th Grade

Art Education Majors collaborated with Engineering Majors at Old Dominion University to create and teach a 4th grade lesson at a local Elementary school. The students will learn about different disciplines in Engineering and use a creative design process combined with math and science to develop something new.

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| LESSON TITLE | <i>Sailing Through Engineering</i> |
| TEACHERS (AKA TEAM MEMBERS) | <i>List team members' first and last names</i> Brooke Benham Hayley Birnbaum Miro Dekic Trent Akins Tim Suddeth Edgar Waitt |
| SOURCES OF INSPIRATION | https://www.bing.com/videos/search?q=landyacht+championship&&view=detail&mid=7678AE25A031B6B4432A7625A031B6B4432A&&FORM=VRDGAR interest video https://www.youtube.com/watch?v=M4CQ4T_K8Hw how a sailboat works video https://northsails.com/sailing/en/2016/09/how-sails-work how sails work http://ircssa.org/model-land-yachts-design-hints-by-robert-weber/ landyacht design tips https://le-www-live-s.legocdn.com/sc/media/files/building-instructions/mm/9686-land-yacht-34347e9f86f59cd453679d0e451d.pdf how to build the lego landyacht |
| ENGINEERING CONCEPT STATEMENT | <i>We will use wind power/ efficiency to sail a land yacht with different wheel and sail size for distance</i> |
| LESSON TARGETS/ OBJECTIVES | At the end of the lesson, students will be able to... Determine how a boat will sail based on its construction Explain how a sailboat works. Build a yacht using legos Judge the best way to face a sail |

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| | Demonstrate how sail size and same size wheels affect distance and speed |
| RELATED VIRGINIA SOL OBJECTIVE(S) ADDRESSED | http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml SOL 4.2 The student will investigate and understand characteristics and interactions of moving objects |
| MATERIALS NEEDED (Resources, supplies, and handouts) | .Items needed: -legos (1 set per group) -table (1 per group) -fan (1 for everyone) -tape measure (1 for everyone) -recording table (1 for us) -pencils/quizzes (1 per person) -Scissors/tape from Teacher -3 different materials, paper, cardboard |
| ROOM CONFIGURATION | <i>2 Tables</i> <i>Tile Floor</i> |
| SAFETY CONSIDERATIONS | <ol style="list-style-type: none"> 1. <i>Do not Stick any fingers in the fan</i> 2. <i>Do not throw anything</i> |
| LOGISTICS/ROLES | <i>Assigned classroom/space (e.g. BAL 2036):</i> <i>List the team member(s) who will fill each role:</i> <i>Meet the elementary school students and lead them to your classroom/space: Hayley Birnbaum</i> <i>Set up the classroom/space: Miro Dekic</i> <i>Restore classroom/space to its original condition: Edgar Waitt</i> <i>Escort the elementary school students back to the central meeting place: Tim Suddeth</i> |

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| PRE LESSON: TEACHER WILL INTRODUCE THEMSELVES AND LEARN THEIR STUDENTS' NAMES AND INTERESTS | Estimated Time: <u> 2 </u> (Should be 2-3 min) |
| Teacher and Student Activity | Special Instructions/Needs |
| <i>Class Discussion and casual socialization for comfort</i> | Quick introductions and talk about interests |
| <i>Everyone introduces themselves, name, age, year, major</i> | |

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| INTRODUCTION TO ENGINEERING: TEACHERS LEAD A BRIEF ACTIVITY TO INTRODUCE THE FIELD OF ENGINEERING AND EXPLAIN WHAT AN ENGINEER DOES | Estimated Time: <u> 5 </u> (This could occur at any point during the lesson) (Should be about 5 min) |
| Teacher and Student Activity | Special Instructions/Needs |
| <i>Trent- We will explain what engineering is and what engineers do day to day and how that affects our lesson.</i> | https://www.youtube.com/watch?v=owHF9iLyxic Start video before 4th graders get in so there's not an ad |
| Ask questions | Who designs the items we use everyday like a cell phone? What is the role of an engineer? How do engineers design what we use everyday? |

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| ENGAGE: TEACHERS LEAD A BRIEF ACTIVITY TO INTRODUCE THE LESSON TOPIC, SEE WHAT STUDENTS ALREADY KNOW ABOUT IT, AND SET A CHALLENGE/QUESTION TO PIQUE STUDENTS' CURIOSITY | Estimated Time: <u> 7 </u> (Should be 5-10 min) |
| Teacher and Student Activity | Probing Questions |
| Show them two boats with different sails and ask which would travel across a tub faster | Which sail would travel faster? |

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| <p>We will show a powerpoint that defines engineering and goes into detail about how the direction of wind can affect objects around it. We will explain the engineering project that we will do. Students will be able to ask questions about the powerpoint and the project</p> | <p>Can someone give an example of how the wind can affect the way objects move? Can someone explain what the project is going to entail and what we are going to be measuring? How does a bigger sail work better than a smaller sail? What sail shape do you think works better?</p> |
| <p>Tim Suddeth will lead this section</p> | |

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| <p>EXPLORE: STUDENTS SHARE AND TEST THEIR IDEAS & HYPOTHESES TO ANSWER THE PRESENTED CHALLENGE/QUESTION THROUGH A HANDS-ON DESIGN ACTIVITY</p> | <p>Estimated Time: <u> 20 </u> (Should be about 20 min)</p> <p>THE HEART OF THE LESSON!</p> |
| <p>Teacher and Student Activity</p> | <p>Probing Questions</p> |
| <p>Brooke(will lead)- Build different boats. Each student will have the same base and the challenge will be to build a sail that will get the boat across the line faster.</p> | <p>What makes certain boats travel farther than the other ones? How will the size of the sail affect how the boat moves? How will the material used for the sail affect how the boat moves?</p> |
| <p>Brooke and others- Go around the room asking students why they are making their sails the way they are (1 engineer major and 1 education major per group helping the students work)</p> | <p>Ex. if a student is making their sail a square, ask why they are doing that and how they think it will make the boat go faster</p> |

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| <p>EXPLAIN: TEACHERS BUILD ON STUDENTS' PRIOR KNOWLEDGE BY SOLICITING AND CLARIFYING THE DISCOVERIES & CONCLUSIONS MADE BY STUDENTS IN THE EXPLORE PHASE AND BY ADDING NEW INFORMATION (VIA MINI-LECTURE, DISCUSSION, VIDEO, DEMONSTRATION ETC)</p> | <p>Estimated Time: <u> 10 </u> (Should be about 10 min)</p> |
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| Teacher and Student Activity | Probing Questions |
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| Miro-Ask about the results | What do you notice about the boat that “won” or was the fastest? |
| Miro-Ask the students why the certain sail size performed better than others. Also why different materials for the sails performed better. | What do you think are some features that could explain why sails make objects go different distances? What would make your land yacht travel better? Have a kid explain why their land yacht would move in the direction it does based on the wind? |

| Teacher and Student Activity | Probing Questions |
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| EXTEND: STUDENTS APPLY WHAT THEY HAVE LEARNED IN THE LESSON TO A NEW PROBLEM/CONTEXT | Estimated Time: __10__ (Should be about 10 min) |
| Relate sail size/ material and distance? | How does different material affect the distance the boats travel. How could you improve the sails to make the boat go even further? Would bigger wheels work better? |
| Hayley Birnbaum will lead | |

| Teacher and Student Activity | Probing Questions |
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| EVALUATE : TEACHERS AND STUDENTS DETERMINE/REFLECT ON WHAT WAS LEARNED DURING THE LESSON | Estimated Time: __5__ (Should be about 5 min) |
| <i>The teachers will give students an individual paper-based quiz which they will collect after the lesson. If you created a quiz as a google document, link to it.</i> | <i>-An Engineer is a person who designs, builds, or maintains engine machines, or public works. T or F? -What is the best way to position the sail on the land yacht? a) Horizontally b) Vertically</i> |

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| | <p>c) Diagonal</p> <p>-What is the best sail size for the wind we used from the fan?</p> <p>a)small</p> <p>b) medium</p> <p>c) large</p> <p>What material worked the best out of the three you used?</p> <p>-Open Ended Response</p> |
| The teachers will give the students a survey that assesses student interest in engineering. | The survey questions will be standard for all the groups and be provided to you. |
| The students will complete the survey and take the quiz. | |
| After the lesson, one teacher (LIST NAME) will tally the quiz results and share with other team members. These will be reported in the lesson reflections. | Trent Akins |
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| Brooke-We wrap up the lesson through an oral discussion | Ask how wind, surface area, and size are all important factors to consider when building something |
| Brooke-Ask for feedback about the lesson | Ask if they enjoyed it and would like to build more objects now that they have learned some contributing factors to consider when building |

Student example:

