**Engineering Lesson Plan**

(Use this same Google Doc for both the Draft and the Final lesson!)

**DIRECTIONS**

This document is accessible through your Team’s Google Site. Go to Team Files→Engineering Lesson Plan. You can also access this document under the “Shared with me” section of your ODU Google Drive.

All team members are expected to work on this document collaboratively. All team members can edit this document simultaneously. You can type directly in the file and you can insert comments (right click and select “Comment” or the menu item Insert → Comment or click the comments button at the top right). Please, note that what you write in this document gets saved automatically.

**Draft Lesson**

Team members will work together to draft a single 60-minute lesson to teach your selected topic. All team members must participate in both the planning and the implementation of the lesson. Education students are expected to be able to explain science and engineering concepts. Engineering students are expected to help engage and interact with the elementary school students. All team members should participate in the dress rehearsal lesson.

**Feedback**

Your team will receive feedback (i.e. comments) on this lesson plan from your instructor(s). Do not delete or resolve any comments that note concerns or suggestions. Instead, reply to the comments to explain how your team addressed the issue. Leave these replies in your final lesson.

**Final Lesson**

After receiving written and oral feedback on the draft lesson, each team will meet to revise and finalize their lesson. Address all noted concerns as described above.

**INCLUDE ADEQUATE DETAIL IN YOUR LESSON PLAN TO ENABLE SOMEONE OUTSIDE YOUR GROUP TO TEACH THE LESSON!**

**YOUR GRADE FOR THE LESSON PLAN WILL BE BASED ON THIS DOCUMENT!**

**Engineering Lesson Plan Template**

**Here is your team’s** [**rubric**](https://docs.google.com/spreadsheets/d/1Bl7IqXqj9gOboaAKs0XSYzy9BUb_xDGpvuZLZLMymjY/edit?usp=sharing) **- click to see where your team lost points.**

**Do not resolve comments that ask specific questions. Instead REPLY to the comments so we can see you have addressed them.**

**I have updated your rubric (was 24 now 34.5). There are some places your team can easily add missed information and gain more points. If you would like to make these changes, please do so and email me your lesson link by Sunday night, and then I will add points to your score. Your lesson is looking good, just a few adjustments and you’ll be in good shape.**

| **LESSON TITLE** | *Come up with a clever title for your lesson. This title will be shared with the elementary school students and their teachers.*  River Rushing Otters |
| --- | --- |
| **LESSON LEADERS**  **(AKA TEAM MEMBERS)** | *List team members’ first and last names*  Malia Ancheta, Brittany Rodriguez, Armani Brooks, Jacob Hightower |
| **SOURCES OF INSPIRATION** | *List all the external resources you used to learn about your content and develop your lessons*  B- asked younger sibling for ideas  M- asked Dad for assistance  Our engineerings friends definitely helped us lay out a blueprint for our prototypes  <https://www.borntoengineer.com/british-engineering-win-americas-cup-first-time-166-years>  <https://justenergy.com/blog/potential-and-kinetic-energy-explained/> |
| **RELATED VIRGINIA SOL OBJECTIVE(s) ADDRESSED** | *Your lesson should address the following SOLs:*  *4.1 / 5.1 The student will demonstrate an understanding of engineering practices by:*   1. *defining a simple design problem that can be solved through the development of an object, tool, process, or system* 2. *using tools and materials to design and build a device that solves a specific problem* 3. *analyzing data from tests of an object or tool to determine whether it works as intended* 4. *using evidence (i.e., measurements, observations, patterns) to construct or support explanations and to make inferences* 5. *identifying limitations of models* 6. *communicating scientific information, design ideas, and/or solutions with others* |
| **LESSON TARGETS/**  **OBJECTIVES** | *Thinking about your lesson topic and the SOLs listed above, determine 3 or more specific lesson targets for your lesson. These are things the students should know or be able to do at the end of your lesson. Use verbs that are observable and measurable (e.g. “understand friction” is NOT observable; “list 2 sources of friction” is observable).*  **At the end of the lesson, the elementary school students will be able to…**   * At the end of the lesson, the elementary school students will be able to explain the engineering design process * At the end of the lesson, the elementary students will be able to apply their knowledge of the engineering design process in order to generate a working solution to solve their problem. * At the end of the lesson, the elementary students will be able to demonstrate the conversion from potential to kinetic energy. |
| **MATERIALS NEEDED (Resources, supplies, and handouts)** | *List all supplies the students will need to participate in the lesson (include EVERYTHING e.g. pencils, scissors, Internet access, device to access Google Slideshow, access to water, etc). Include any relevant notes, for example, if students will share supplies or how supplies will be distributed or used.*   | *Quantity* | *Material* | *Notes/explanation* | | --- | --- | --- | | *1* | *Duck Tape* | *Reinforcement of paddle* | | *2* | *Foam Trays* | *Body of the boat* | | *5* | *Rubber bands* | *Tension creator/propeller* | | *2* | *Plastic Cups* | *Creates room for creativity (we used it as a flagpole)* | | *1* | *Scissors* | *To Cut* | | *4* | *Straws* | *Flagpole* | | *4* | *Wooden Skewers* | *Structural integrity of boat* | |  |  |  | |  |  |  | |  |  |  | |
| **SAFETY CONSIDERATIONS** | *Describe possible safety concerns, appropriate precautions, and any messages you may need to convey to elementary school teachers/parents.*  A possible safety concern would be the elementary students using scissors. |
| **LOGISTICS/ROLES** | *List the team member(s) who will fill each role:*   * *Meet the elementary school students and lead them to your lesson space (10:50):* Malia Ancheta * *Transport supplies and demonstration/testing materials to the lesson site (10:00-10:45):* Jacob Hightower * *Set up the lesson space (10:30-11:00): Jacob Hightower* * *Restore space to its original condition (12:30-1:00):* Brittany and Armani * *Escort the elementary school students back to the central meeting place (12:30):* Malia Ancheta * *Take, post and share photos of the lesson: Brittany Rodriguez* * *Prepare and distribute hand-outs for students: Armani* * *Collect quiz and survey handouts from students, tally and share results with other team members:* Brittany |

| **Pre Lesson**  **Estimated Time: Approx 2-3 min** | **Lesson leaders should introduce themselves and learn their students’ names.** |
| --- | --- |
| **Responsible Party** | **Activity/Specific Question for the children** |
| *Brittany Rodriguez* | Ask for their names and their favorite animal |
| *Malia Ancheta* | Ask kids to reciprocate a similar question to team members to learn our names |
|  |  |

| **Introduction to engineering**  **Estimated Time: Approx 6 min** | **Lesson leaders introduce students to engineering (2 mins) and one specific engineer from an underrepresented group that will connect with students’ background/interests (2 mins). Lesson leaders introduce the engineering design process (2 mins).**  *List 2-3 probing questions your team will ask the children.* |
| --- | --- |
| **Responsible Party** | **Activity/Specific Question for the children** |
| *JACOB Hightower* | What do Engineers do? |
|  | Give examples of engineering |
|  |  |

| **TOPIC INTRODUCTION:**  **Estimated Time: Approx 5-6 min** | **Lesson leaders pique students’ curiosity with a brief activity (question/surprising demo) that introduces the lesson topic and determines what students already know about it.**  *List 2-3 probing questions your team will ask the children.* |
| --- | --- |
| **Responsible Party** | **Activity/Specific Question for the children** |
| Jacob | *Do you know what paddle boats are?* |
|  | What causes a boat to move? \*then explain that they will be creating a paddle boat without any electrical aspects |
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| **Engineering Design Process:**  **Estimated Time: Approx 30+ min** | **Lesson leaders present a clearly defined hands-on engineering design challenge. Students will engage in all stages of the engineering design process: ask, imagine, plan, create, test, improve, and share.**  *Explain how and when the children will receive their supplies.*  *Explain how and when the children will test their designs.*  *List the probing questions you will ask the children during each phase of the EDP.* |
| --- | --- |
| **ASK: how will you help the children define the problem they are solving?** | |
| **Responsible Party** | **Activity/Specific Question for the children** |
| Brittany | Q: What is the challenge? A: creating a boat that functions using a paddle (there's no wrong answer) |
|  | \*answer to “ASK” : propose the idea of thinking outside of the box, explain that there's various ways to make a boat out by using all materials provided. |
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| **IMAGINE: how will you help the children brainstorm and explore solution ideas?** | |
| **Responsible Party** | **Activity/Specific Question for the children** |
| **Malia** | Q: What would you use for the base of the boat? |
|  | Q : What would be the best material to use for the paddle? |
|  | What makes a real boat move? |
| **PLAN: how will you help the children decide on a plan for their design?** | |
| **Responsible Party** | **Activity/Specific Question for the children** |
| **Armani** | What materials will you use for the different parts of the boat? |
|  | Ask them what problems their boat may face and lead them to helpful solutions. I.e how to make the paddles waterproof. |
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| **CREATE: how will you guide the children as they create their prototypes?** | |
| **Responsible Party** | **Activity/Specific Question for the children** |
| **Brittany** | Giving vague suggestions as to how to use materials for the best results, ex: one of the materials given is great for water resistance, one of the materials given floats without issues |
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|  |  |
| **TEST: how will you guide the children as they test their prototypes?** | |
| **Responsible Party** | **Activity/Specific Question for the children** |
| **Jacob** | Explain the process of getting their boats from one end of the testing station to the other, identify obstacles that are imperative to avoid, and wish them luck! Winners move on to Round 2. |
| **Jacob** | We will let the kids know that it is okay to fail and failure is an important part of the engineering design process. Many engineers will test their prototype until it fails. This helps engineers find the weakness in the prototype, so they are able to fix it. |
|  |  |
| **IMPROVE: how will you help the children interpret their test results in terms of science and engineering principles and redesign accordingly?** | |
| **Responsible Party** | **Activity/Specific Question for the children** |
| **Armani** | Ask them if their paddle boat was successful or if it failed. |
|  | Ask them what they think made their boat fail or pass the test. |
|  | Ask them what they're gonna do to improve their next design. |
| **SHARE: how will the children explain the success of their prototypes to the group?** | |
| **Responsible Party** | **Activity/Specific Question for the children** |
| **Malia** | The children will explain the success of their prototype by explaining what part of their designs worked and what they need to improve if they had more time to work on their prototype. |
| **Malia** | Ask each group if their prototype was successful, why or why not? |
|  |  |

| **EVALUATE:**  Estimated Time: Approx 5 min | **Lesson Leaders and students determine/reflect on what was learned during the lesson.**  *Explain how you will determine how well the children met the learning targets of the lesson.*  *List the specific questions you will ask the children.*  *Explain who will distribute and collect the standard surveys that all children complete.* |
| --- | --- |
| **Responsible Party** | **Activity/Specific Question for the children** |
| Malia | We could use a performance assessment (lab report) for example they can talk about what they could improve on and what worked. The students can also go into detail about how their solution was or was not successful. |
| Brittany | Creating a simple rubric rating how well their boats stayed afloat, if their boat propelled (without the help of wind), if all constraints were met, if their boat was successful (did it make it to the end of the testing station?) . |
| All team members | Will distribute and collect surveys completed by students |

**Link to any SUPPLEMENTARY MATERIALS** (handouts, worksheets, data collection tables, assessments, etc.). Also post these in your team files section of Google Sites.

MATERIALS NEEDED LINKED BELOW: \*\*INCLUDE RULERS AND PENS/PENCILS

<https://docs.google.com/document/d/16c39gEY_Wu8eO6U5FcrPid6u5oCy0g7opAa9Zbf80q8/edit?usp=sharing>

Assessment that will be handed out to the kids at the end

[Engineering Design Process Lab Report](https://docs.google.com/document/d/14SVSlaG9Enmv1nX5nkdjIw0ok6E1gIbou98eFoAVyOg/edit?usp=sharing)

RUBRIC FOR STUDENTS TO FOLLOW

[EDP RUBRIC](https://docs.google.com/document/d/1Qqv2A7gy29uqmL5yXg_CHonlbg-iva3EflIS_qPVSRw/edit?usp=sharing)