***WABS STEM PBL Unit/Lesson Plan Template***

**Description:**

Problem-based learning (PBL) is focused, experimental learning organized around the investigation and resolution of messy and real world problems. The Final Unit will allow you to organize your lesson in a problem solving environment where students engage in learning in relevant and connected ways. Teachers function as a coach to guide student inquiry and facilitate learning to deeper levels of understanding for your students.

Research indicates that PBL is a superior pedagogy for promoting student engagement in the learning process. Torp and Sage (2002)1 broaden the impact of this pedagogy and confirm that it increases motivation, makes learning relevant to the real-world, promotes higher order thinking and self-regulated learning in students.

Generally, the teacher will present the problematic situation. The problem is ill-structured and messy (multiple sub-problems), not easily solved and **does not result in one right answer**. Students engage in active problem solving, and a teachers guide and coach. A collaborative environment provides for the sharing of information within and between groups as they work to resolve - some may test and re-resolve - their problems. Authentic assessment compliments the problem solving process.

**WABS Final PBL Requirements**

1. With your team, develop a PBL unit and PBL unit overview.
2. Teach the PBL in your classroom
3. Gather artifacts from the lesson (such as student work, student interviews, photographs, or other ways to track student engagement and learning about content & practices, soft skills, pathways, or identity as a person who has potential in STEM)
4. Participate in a Lesson Study with your team and the WABS Program Director
5. Submit the unit using the agreed upon format to the WABS Program Director
6. Present the unit at the May 2020 WABS Showcase for Success

1 Torp, L., & Sage, S. (2002) Problems as Possibilities: Problem Based Learning for k16 Education (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development

**PBL Procedure[[1]](#footnote-0): What is in a PBL Unit?**

Use this page as a reference. The PBL procedure may be one lesson or may be the process throughout the whole unit. Lessons may focus on a small part of the procedure or highlight the iterative process needed to get closer to a solution**.**

**Understand The Problem*:*** Describe how you will launch your problem. In this portion of the lesson, students will work towards a common understanding of what the problem is and what they need to know in order to solve the problem.

* Introduction/Problem Launch
* Brainstorm What Students Know/Need to Know
* Define/refine the Problem

**Explore the Problem*:*** How will students’ explore multiple ideas, pathways, and challenge their current conceptions? How will all students access the information/context? The students (groups) will develop multiple solutions to the problem based on their evidence that will be shared in the next section.

* Gather Information
* Share Information
* Generate Possible Solutions

**Resolve the Problem*:*** Students should be able to provide an argument for each of the possible solutions and be given an opportunity to share and critique arguments. How will students reflect upon and share what they’ve learned? How will students synthesize their learning? If there are presentations involved with this PBL, how do you plan to help the non-presenters learn from presentations?

* Determine Best Fit solution
* Present the Solution
* Debrief the Problem

**Unit Overview**

**Providing Electricity to a Growing Population**

Target Grade Level(s): 6th, 7th and 8th grades

Subject(s): Science and ELA

Author(s): Nasim Badribigi, Erin Duffy, Chris Hazelbrook

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| **Problem Statement:** |
| How can we provide energy to a growing population in Snohomish County and still be good stewards towards the environment? |

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| **Unit Overview and Table of Contents:** |
| The county has bought a plot of land and wants to use it as a site for energy production to accomodate for their projected growth in the coming years. The county has tasked several research groups with the job of finding the best energy source that is the most timely, cost effective, and makes the best use of the plot, all while being an environmentally friendly option that meets the needs of the stakeholders. Students will need to collaborate with their group to fulfill their role in their group and the prompt for the project  Understanding the Problem:   * Lesson 1: Student teams will discuss and learn the meaning of PBL. Student teams will participate in team building exercises and assign roles within their group.   Exploring the Problem:   * Lesson 2: Student teams learn what it means to be a good steward to the environment and learn about the different ways that a city can get electricity. Student teams start their research for their assigned energy type. * Lesson 3: Student teams research Spencer Island and brainstorm ways to utilize the plot to create electricity. Student teams consider their environmental impact to the plot, as well as costs and other considerations. Students begin their project design. * Lesson 4: Student teams are provided general info on natural hazards and potential consequences on energy production. The teams apply what they have learned to minimize impacts on the production of energy.   Resolving the Problem:   * Lesson 5: Student teams will present their final project proposal to the class. Students will complete an individual essay recommending the best plan that best solves the problem statement. |

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| **Standards (NGSS, CCSS, CTE):** |
| NGSS:   * MS-ETS1-2 Engineering Design: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. * MS-ETS1-1 Engineering Design: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. * (MS-LS2-4): Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.   CCSS for ELA middle school:   * ELA standards for Speaking and Listening * Comprehension and Collaboration:   + [CCSS.ELA-LITERACY.SL.6.1](http://www.corestandards.org/ELA-Literacy/SL/6/1/): Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.   + [CCSS.ELA-LITERACY.SL.6.1.B](http://www.corestandards.org/ELA-Literacy/SL/6/1/b/): Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.   + [CCSS.ELA-LITERACY.SL.6.1.C](http://www.corestandards.org/ELA-Literacy/SL/6/1/c/): Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.   Presentation of Knowledge and Ideas: [CCSS.ELA-Literacy.SL.6.4](http://www.corestandards.org/ELA-Literacy/SL/6/4/)  Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.  [CCSS.ELA-Literacy.SL.6.5](http://www.corestandards.org/ELA-Literacy/SL/6/5/)  Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.   * ELA standards for Writing-Informational * Research to Build and Present Knowledge:   + [CCSS.ELA-LITERACY.W.6.7](http://www.corestandards.org/ELA-Literacy/W/6/7/): Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.   + [CCSS.ELA-LITERACY.W.6.8](http://www.corestandards.org/ELA-Literacy/W/6/8/): Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. [CCSS.ELA-LITERACY.W.6.9](http://www.corestandards.org/ELA-Literacy/W/6/9/): Draw evidence from literary or informational texts to support analysis, reflection, and research. |
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| **Soft Skills:** |
| Communication  Collaboration  Creativity  Critical Thinking |

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| **Locally and/or Personally Relevant for Students:** |
| * Snohomish County is the county most of our students will be living in. The impacts of the sources of energy may affect the quality of their environment, climate and their future quality of life. (This unit can be easily adjusted to fit any locale this lesson takes place in) * Students will learn how their city gets their electricity * Students will learn about the natural disasters that can happen in their community |

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| **Connections to career and educational pathways:** |
| * Lots of information was provided by the Snohomish County & PUD services. * Student roles mimic actual jobs responsibilities and tasks * Students may one day have to compete with others to present their idea for approval in other educational and career pathways. * Students will realize that there could be more than one answer to a problem statement, and some may be more efficient than others. * Students will learn to rate criteria by importance and use that to make decisions. * Students will realize the value of fulfilling their role in a team project. |

1. The sub-sections of the procedure section (e.g., Understand the Problem, Explore the Problem) are from the Illinois Math and Science Academy’s PBL Teaching and Learning Template, however, the descriptions were developed by WABS and do not necessarily represent the views of IMSA. [↑](#footnote-ref-0)