

# High School BioMade Extended Learning Opportunity Design Template

**Student Name:** Jedi Smith

**Project Title:** Mechanical properties of PLA Scaffolds

**Teacher Mentor:** Mr. Kenobi

**Industry Mentor:** Sue Skywalker

**Step 1: PLANNING** (Student, Teacher Mentor, Industry Mentor work together)

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| <b>Competencies</b><br>The student and mentors should work together to determine the end goals of the project. Please list what the student will know and be able to do as a result of this project.  | <b>Main Goals:</b> <ul style="list-style-type: none"><li>• Research medical uses of PLA in tissue engineering</li><li>• Learn 3D CAD software</li><li>• Conduct experiments to test strength of different designs (Nature of Science)</li></ul>   |
| <b>Project Description</b><br>The student and mentors should work together to give a detailed description of the project. What is involved? Describe the final product and presentation. Include a broad description of what will be assessed. Include what the product will look like and where and how students will showcase their work. | After preliminary research to put biomade scaffolding in context, I will design a series of 3D cylinders in CAD that have different infill patterns, (lattice geometries). After I print a few copies of each, I will design a series of experiments to collect data about the strength of my designs, including load strength or shear strength. I will share my results in a presentation to my biology class   |
| <b>The Essential Question</b><br>The student will develop an essential question which focuses the activity, motivates the student, and drives the learning. It should be broad enough not to be answered easily and can be approached from many different entry points. It lends itself to interdisciplinary research.                      | <b>My Essential Question:</b><br><i>How do different designs affect the mechanical properties of PLA Scaffolds?</i>   |
| <b>Industry Mentors</b><br>Identify industry mentors who offer a rich source of knowledge, refined application, and experience in the project area. Describe their role in the project planning, implementation, student mentoring, and assessment.   | Ms. Skywalker will help me to learn how 3d printed scaffolds are used to help design and grow organs, specifically bone tissue. She can also help me make sure that my experiments that I conduct are controlled and help me figure out the best way to collect my data. I also hope that she can make sure that I can present my data clearly in graphs etc and help connect my results to the work she is doing |

**Step 2: IMPLEMENTATION AND FORMATIVE ASSESSMENTS**

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| <b>Timeline and Benchmarks</b><br><b>Create a timeline</b> of benchmark points that Provide a foundation for the final project. Benchmark points can be small, discreet projects, rehearsals, practices, drafts or other work that allows the student to move towards success. Students should have ample opportunities to have work reviewed before the final presentation. A timeline provides a framework | <ul style="list-style-type: none"><li>• Early March: Begin background research. Start to learn 3D CAD software</li><li>• Mid March: Work on different designs in CAD</li><li>• Late March: Print Designs + troubleshoot print process</li><li>• Early April: Design experiments and prepare data tables. Print extra copies of designs</li></ul> |
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| to assure that this preparation and review happens.   | <ul style="list-style-type: none"> <li>• Mid April: Conduct experiments and collect Data</li> <li>• Late April: Analyze data and create graphs, etc.</li> <li>• Early May: Work on presentation</li> <li>• Mid May: Practice presentation, share with teacher, get mentor feedback</li> <li>• Late May: Present my work to my class</li> </ul>   |
| <b>Research</b><br>The student should identify how they will research the knowledge base of their ELO subject matter to prepare for implementation and engagement. This may be their first benchmark point of review and will provide important opportunities to check assumptions and reflect on new ideas and avenues that the research revealed. | Key research questions: <ul style="list-style-type: none"> <li>• How is PLA filament currently used to create tissue scaffolds? <ul style="list-style-type: none"> <li>◦ What are the current standards for PLA scaffolds?</li> </ul> </li> <li>• What are the specs/limitations of the 3D Printer at my school?</li> <li>• What are key metrics that are used in the development of scaffolds?</li> </ul> |
| <b>Reflection</b><br>Identify structures that guarantee student input and reflection is captured along the way. Ask students to reflect on their progress in the ELO, and have them self-assess benchmark points in relation to the larger, final project. <b>List what</b> methods students will use for reflection and self-evaluation            | <b>Reflection activities</b> <ul style="list-style-type: none"> <li>• Keep a log of activities that I complete every day during my ELO period</li> <li>• Keep a document where I can keep track of notes from my mentor meetings</li> <li>• Make a timeline so I can see if I am falling behind</li> </ul>   |
| <b>Overseeing educator and student communication</b><br>The mentor teacher, industry mentor and the student should establish together <b>how and how often</b> the student will communicate.  | <ul style="list-style-type: none"> <li>• I will make sure that I check in with Mr. Kenobi once a week so he knows how I am doing. He wants to schedule me for FLT every Monday</li> </ul>  |
| <b>Community partner communication</b><br>Describe how regular communication with the industry mentor will take place. Industry mentors should be part of the student reflection so that they can see students' developing understanding. Describe how the industry mentor will participate in the assessment of the project                        | <ul style="list-style-type: none"> <li>• I will have meetings every 2 weeks with Ms. Skywalker. She said that we can meet during 8th period on Fridays (Zoom)</li> <li>•</li> </ul>  |

### Step 3: SUMMATIVE ASSESSMENT

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| <b>Final Demonstration of mastery</b><br>Describe in detail what the final demonstration of mastery will include, what will be assessed, and who will assess each component. <u>An actual Product and a Presentation are usually components of the demonstration of mastery and their preparation has been incorporated throughout the learning experience.</u> | In my final presentation I will be sure to... <ul style="list-style-type: none"> <li>• Explain what tissue engineering is and why scaffolds are important to designing tissues</li> <li>• Explain my 3D printing designs and how I made them</li> <li>• Explain the ways that I tested my 3D prints</li> <li>• Go over my results, explain what they mean, and how my results might be important to the BioMade Industry</li> <li>• I can make extra prints for my classmates to handle!</li> </ul> |
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| <p><b>ELO Presentation</b></p> <p>Preliminarily identify when the presentation on the ELO will occur. Note who will be on the assessment team and what, if any, special equipment or facilities may be needed. Usually, the mentor teacher(s), the industry mentor, the middle school lead and the project director will, at a minimum, comprise the assessment team.</p>   | <p>Mr. Kenobi wants me to present to my Biology class at the end of May.</p> <p>I will also be giving a presentation during ELO presentation days at the end of the year, which is for a panel of teachers.</p> |
| <p><b>Assessment of mastery</b></p> <p>Identify common assessment goals that will be met during the final demonstration. As the presentation of this demonstration develops, these goals may be modified through negotiation between the overseeing educator and the student.</p> <p>Assessors will be given the assessment rubric at least one week in advance with a brief description of the final demonstration of mastery and will be informed of what competencies they are assessing.</p> <p>Assessors should also be given written guidelines for the format of the performance assessment. While the process may differ due to personalization, it should include the student's presentation of mastery of competencies, an opportunity for assessors to ask questions of the student, provision for the assessors to score against the rubric(s) and an opportunity to talk amongst themselves about the demonstration, and a final meeting with the student to provide feedback. The teacher of record, who may be the overseeing educator, will submit a grade for the ELO within one week of the assessment.</p> |   |

Adapted from the **New Hampshire Extended Learning Opportunity Design Template**