

## Engaged Learning Project Draft Template

**Title of Project: Prosthetics in Action**

**Subject(s): Science**

**Grade Level(s): 7th and 8th**

**Abstract:**

*Three- or four-sentence description of your project and audience. Include a statement of what students will be doing. What “adult/professional” role will they assume? How will the learning be situated in an authentic task?*

*Students will assume the role of a prosthetist, a person who engineers prosthetic devices, to create a 3D CAD drawing of an original device for a human or animal in need of a prosthetic for a specific task. Students will do online research on muscles and bones, Newton’s laws and simple machines, and current prosthetics in order to complete this project. Students will also be working with guest speakers from different areas of the prosthetics world to motivate, innovate, and donate their designs.*

**Learner Description/Context:**

*Characteristics of the learner and description of the learning environment(s) where the learning experience will take place. Help others “see” your local context in order to determine if they can replicate it. Include culturally-influenced interests, ways of learning, funds of knowledge that exist among students, parents and the community. Explain how these assets will be used to strengthen the learning experience for students.*

*The students will be working in the classroom on devices researching and viewing materials provided on the project website. They will use their devices to turn in work, give feedback to other projects, and create designs using Tinkercad. The initial designs will be on paper when they are brainstorming. The hook video and some of the videos we have included provide insight into how and why prosthetics are made in other parts of the world and how these prosthetics affect those receiving them. All students are considered in their learning methods by providing articles and videos for different learning styles. We also provide Google Read and Write extension which allows students to have the text read to them.*

*Students will be encouraged to use either Google Read and Write or Immersive Reader on Microsoft Edge, so students who need the support of read aloud and speak to text.*

**Time Frame:** *How long will this learning experience take to complete and how much class time will be dedicated to the learning experience during this time.*

*We envision this process taking up to 2 weeks depending on the engagement level of students. They will work during and possibly outside of class to complete portions of the project while they work through the design process. This is designed as a review of both 7th and 8th grade content allowing the students to put their knowledge in real world scenarios.*

**Standards Assessed:**

*What local, state, and national standards have you addressed? (Include GA technology integration standards, local technology standards, and/or ISTE NETS-S)*

*7 th grade: S7L2. Obtain, evaluate, and communicate information to describe how cell structures, cells, tissues, organs, and organ systems interact to maintain the basic needs of organisms.*

*c. Construct an argument that systems of the body (Cardiovascular, Excretory, Digestive, Respiratory, Muscular, Nervous, and Immune) interact with one another to carry out life processes.*

*8 th grade: SPS8. Obtain, evaluate, and communicate information to explain the relationships among force, mass, and motion.*

*b. Construct an explanation based on experimental evidence to support the claims presented in Newton’s three laws of motion. (Clarification statement: Evidence could demonstrate relationships among force, mass, velocity, and acceleration.)*

*d. Use mathematics and computational thinking to identify the relationships between work, mechanical advantage, and simple machines.*

*ISTE-*

*Standard 1: empowered learner 1a, 1b, 1c, 1d*

*Standard 2: digital citizen 2b and 2c*

*Standard 3: knowledge constructor 3a, 3d*

*Standard 4: innovative designer 4a, 4b, 4c, 4d*

*Standard 5: 5b, 5c*

*Standard 6: 6a, 6b, 6c, 6d*

*Standard 7: 7a, 7b, 7c*

**Learner Objectives:** *Write a statement of what students are going to know and be able to do as a result of this learning experience and how it will be measured.*

*Students will be able to explain how your muscles interact with your (bones and joints) to make your arms and legs move.*

*Students will be able to describe how Newton's Laws of motion affect the movement and functionality of the prosthetic.*

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*Students will be able to use TinkerCAD to accurately create a prosthetic with 2 simple machines. All of these objects will be measured through rubrics linked here. [CER](#) and [Engaged Learning](#)*

### **The “hook” or Introduction:**

*A brief description of how the learning experience will be introduced to students and why the project “should” be interesting/motivating to students.*

*Video of Hugh Herr, a self motivated prosthetic designer who lost both his legs due to frostbite.  
<https://youtu.be/a2z8CE2vomY>*

*Video of David Sengeh, a culturally motivated prosthetic designer who is from Sierra Leone and works for Hugh Herr.  
<https://youtu.be/rvkMauaHxBw>*

*Both of these men are at the top of the prosthetic designing, creating, and innovating world but are working for different reasons. We believe these videos will inspire students to want to help people from different walks of life and see the need for this project.*

### **Process:**

*The process is the way you structure the learning to engage students in the project/learning experience goals and objectives. How are they going to accomplish the task? What are the students doing? What is the teacher doing? How are you assessing the process of learning? How is the student directing the learning? A sequence of unfolding events is usually provided and a timeline is often used.*

*Students will assume the role of a prosthetist, a person who engineers prosthetic devices to design their own devices. The teacher will show them 2 hook videos of 2 men with different motivations for creating prosthetics. Students will then research how the bones and muscles work and then, learn about how simple machines are used in everyday life. This research will take place in the classroom with the teacher facilitating learning and the students’ goal of accurately completing a CER [Student Example](#). [Completed example](#). Depending on if they are in 7th or 8th grade this information could be a review or exposure for the first time so the teacher will need to be able to differentiate based on the student’s knowledge level. After the initial research, students will start looking at the world of prosthetics. They will select and take notes on 3 articles to read and 3 videos to watch out of a [long list](#) provided on the project website ([engagemstem.shutterfly.com](http://engagemstem.shutterfly.com)) by the teacher.*

*Then the teacher will bring in 3 guest speakers to come talk to the kids. Guest speakers: 1st an engineer who works on below the knee prosthetics in Athens, GA. Our 2nd speaker is a representative from the VA Clinic in Austell where we will be donating our human ideas. Our 3rd speaker is a representative from Petsthetics (<https://petsthetics.com/>), a company who specializes in prosthetics for animals where we will be donating our animal ideas. These speakers will discuss the design and engineering process with students and the most important factors of design for the client. These speakers will serve as another layer of engagement, motivation, and collaboration for the students.*

*Students can then decide to work alone, in partners, or groups of 3 for the remainder of the project which is designing their own prosthetic. The prosthetics can be designed for an animal or a person and can be for any limb and any purpose. For students to actively collaborate and save materials students will be encouraged to use Google Docs or Office365. Students must include the functionality of the muscles/joints they are replacing and use at least 2 simple machines to increase functionality in their prosthetics. They will go through the design process over several days and eventually draw or use Tinkercad to create a digital image of their prosthetic. The teacher will be actively monitoring the design processes in the room by facilitating learning, asking formative questions, and encouraging students to think about the “client”. Students will analyze their designs effectiveness at each step and give feedback on other designs in the classroom through the [website](#) discussion board. The teacher will also be giving feedback to student designs during this time. At the end of the project, the students and 3 guest speakers will vote for their top prosthetic in each category and those designs will be sent with the guest speakers as donations.*

### **Product:**

*What is the end-product the students will produce? Who will use/care about the product? Why will the product be meaningful to students? How is technology integrated within this product? How will you assess the product?*

*The final product for this project is an accurate drawing or TinkerCAD drawing of a functional prosthetic that uses knowledge of muscles and simple machines to complete a specific task for either a human or an animal. These projects are meaningful because the ideas will be donated to either the VA in Austell or Pethetics.*

*The product will be assessed based on the following [rubric](#).*

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**Technology Use:** What technologies are critical to the project and how will they be used (examples: To communicate with peers/mentors, to construct/publish original products, to analyze data, etc.) How does the proposed technology use in this learning experience support the indicators of engaged learning?

Technologies used in this project are student devices for research including reading articles and watching videos, an online platform such as the website LMS with blog or discussion board functionality to give and receive feedback on their designs, and TinkerCad, an online CAD program where students will be designing their prosthetics.

### **References and Supporting Material:**

List materials that you used to develop this learning experience. List supporting materials that the instructor would need to implement this learning experience. What would need to be made? (Rubrics? Videos? Samples? Books) Include links to existing Web resources that a teacher would use to understand and implement this learning experience. (For example, if students will be using the Little Kids Rock Website, include the URL somewhere in your template.) Use APA 6 Style.

The teacher will need to create the lists of articles and videos students watch, the rubrics needed for both the CER and the final CAD drawing, [Google slides](#) of information for differentiation, and the [website](#) to house all the information and share the final products.

*What modifications have you made since you submitted your “idea” for feedback?*

We added more guest speakers that are specific to prosthetics in the SouthEast, added the donation component to our project to further outside the classroom engagement and motivation.

We have also added rubrics for assessments, student examples of the CER and CAD drawings, and improvements to websites.

*Which indicators of Engaged Learning will be high in this lesson and Why?*

*Challenging, authentic, student directed, multidisciplinary, explorer, teacher, producer.*

*This EL is challenging because the students have to think through their design to best aid a person or animal who needs this device to enable them to perform tasks each day. It is student directed because they are researching the information and using it to go in their own direction and design their own device on TinkerCAD. There is not a set limit of choices, students can design any type of prosthetic or assistive technology even if they wish. It is multidisciplinary because they will be using their math, reading, and writing skills to create their final product. The students fall into all the student roles of explorer, teacher and producer as they work through the stages of the project and create their final design.*

*Which indicators would you like to strengthen?*

*In this final draft, we have strengthened the collaboration and outside the classroom indicators. In the future, we would like to expand technology even more. One way this could be achieved by virtually interacting with the guest speakers to allow more collaboration throughout the project.*

*What LoTI level do you think this lesson would be and Why?*

*This project is a level 5 with the potential of being a 6 based on the student’s actual products. The end product of the design will be high quality and will have great impact on the students because they see that even as 7th and 8th graders, they can help a person or animal in need by using technology at their fingertips!*

*What help would you like to receive from us?*

*Teachers are always looking for more guest speakers to come into the classroom so if KSU has a student or professor working on prosthetics, we would like to meet and share this project with them.*