



STIIX™

# Lesson Plan

Hey there!

My name is Alex Reader and I am the founder here at STIIX.



I am a former engineer & teacher- and I have a huge passion for helping shape students minds through STEAM.

If this is your first STIIX lesson, we just want to say thank you! We hope both you & your students enjoy the hands-on activities, and please know we are here for any support along the way.

## Prosthetic Project



**Topics: Materials Science, Safety**

**Career Exploration: Biomedical Eng.**

**Length: 2-3 Hours**

**Teams: 1-2 students**

All of our projects follow the infamous 'Engineering Design Process', shown below. This process is so meaningful to me because not only is it applicable here for this activity, but also in life...Design constraints are representative of the real world, failure is okay, and constantly making improvements is what life is all about!

The purpose of this lesson plan is just to point you in the right direction to all the helpful resources we provide to help make this activity a smooth, memorable, and impactful one!

If any question pop up at all after scanning through, please do not hesitate to call or email!



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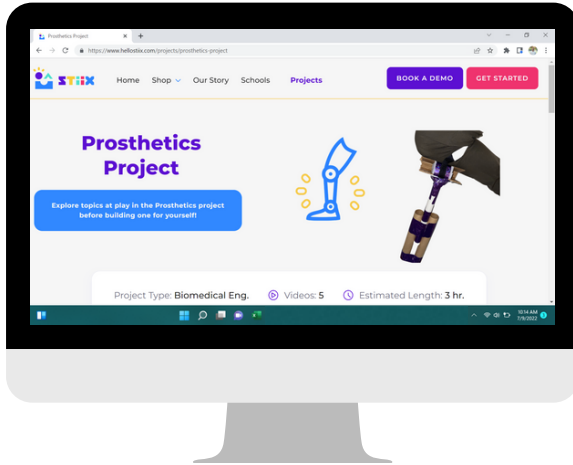
## The Engineering Design Process



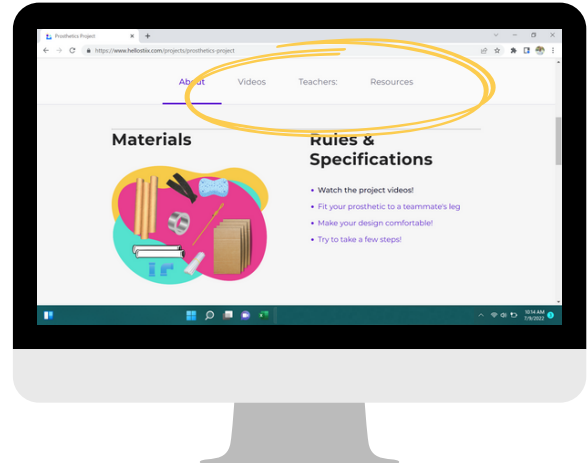
# So where do I start?

In case you have not found it already, you will want to navigate to the Prosthetic project page.

To locate it, click on the "Projects" tab on our website and click the  icon, or feel free to scan this QR code:



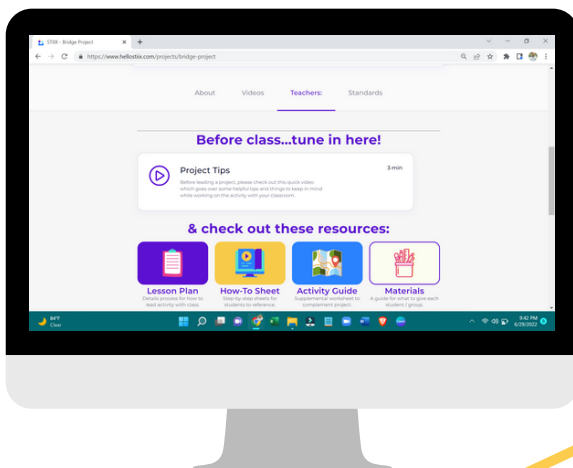
If you see this, you are in the right place



Scroll down and you will see where the project videos are housed, along with the rest of our resources for you!

## Beforehand:

Don't worry, preparation is super minimal! We want to make this as easy as possible for you!

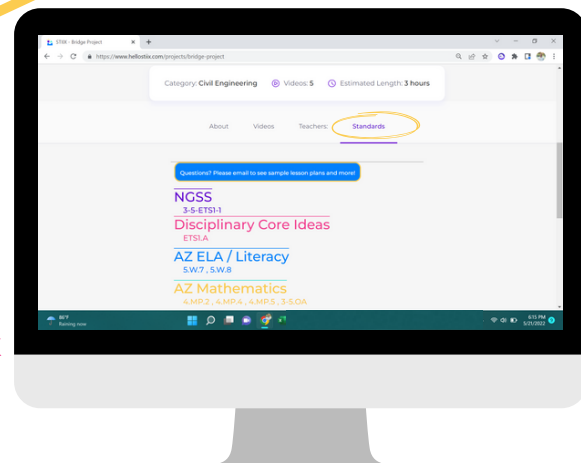


Be sure to check out our TEACHER TIPS VIDEO that we make for each project. In them, we detail helpful insight for how to best lead the project at hand!

1.

2.

Our projects align with some of the latest national standards. Click through the 'Standards' tab to see how the content meshes with your grade band & initiatives..



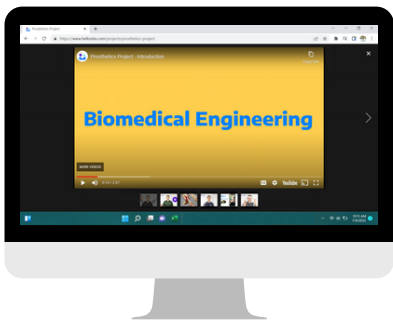
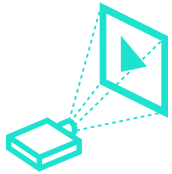
## Prosthetic Project Objective:

Students will team up and be able to design and build a semi-functioning prosthetic leg to attach to the lower part of their knee. This project takes place in the context of being tasked to build a prosthetic for a woman who unfortunately just lost her leg in STIIX-Ville.

## Key Vocabulary

Please keep an eye & ear out for the following vocab words:  
**Materials, Biomedical Engineering, Prosthetic, Amputation**

## The Process:



### 1. Project & Play Videos (10-15 mins.)

STIIX has a series of 5 videos we play for the students to introduce the project and how to go about building it.

Optional: Allow well-behaved and respectful students to be the ones who play the videos for the class

Optional: Pause when prompted to discuss the inquiry-based learning questions!

- V1 = Introduction
- V2 = Academics
- V3 = 'How- To'
- V4 = Testing & Eval.
- V5 = Industry Spotlight



### 2. Group up & Brainstorm (5-10 mins.)

- Break up into teams of 1-2
- Prompt them to recollect our task & assign person who leg will be designed for
- Get ideas / design solutions down on paper
- Think of it as thinking time... talk to partners, ask questions, THINK BIG!
- Once you green light their design, they are free to get their materials
  - Green light if design looks/sounds appropriate & they have a plan for the construction!



### 3. Pass out Materials (<5 mins.)

Take time to set out materials in an organized fashion for students before class, while videos are playing, or while they are brainstorming.

#### Individual Mats.

- x3 PVC Pipes
- x3 Cardboard Tubes
- x4 Cardboard Sheets
- x2 PVC elbows & x2 couplings
- x1 Velcro Strip
- x1 Sponge
- String (one wingspan worth)
- Duct Tape

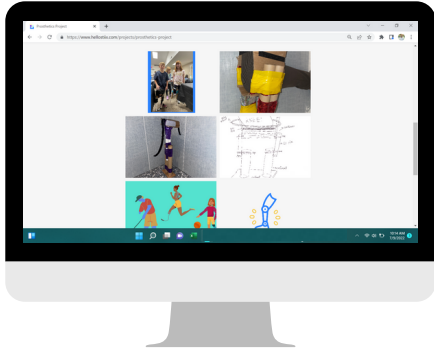


#### Shared / Group Mats.

- How-To Sheets
- PVC Cutters
  - Teacher only
- Hot Glue
- Markers to draw design ideas
- Newspaper Sheets

## 4. Get to Building (1 - 1.5 hrs.)

- Pass out "Step-by-Step" sheets
  - If students ask you questions, ask them if they have referenced the sheet before you answer/help them
- Optional: Leave the "Gallery" section of the project page up while students are building

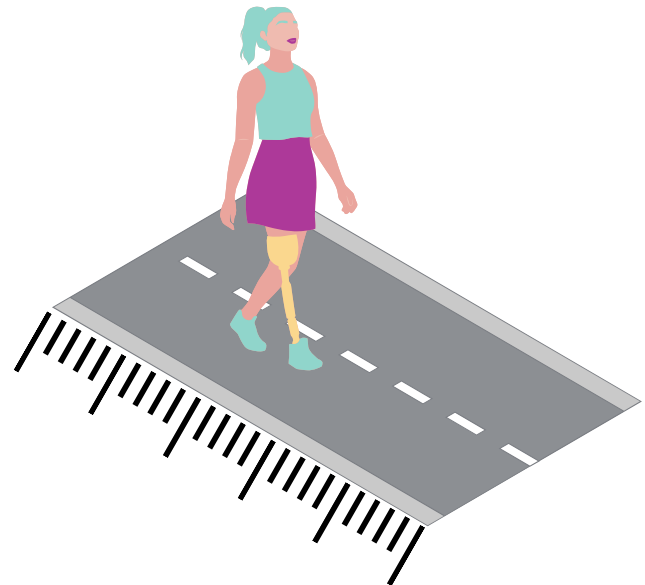
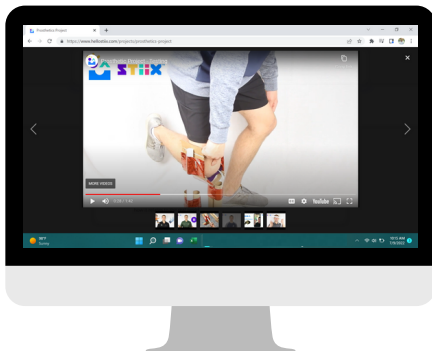


- Hot glue guns will be used
  - Make sure students are wearing gloves while using it & working over newspaper sheets to prevent a mess
- If project will carry over into another day, have students write name on project or sheet of paper all their supplies are on.



## 5. Testing / Cleanup (~15 mins.)

- Follow testing instructions per the 4th video
- Optional: Have students measure how many steps they can take with their prosthetic leg
- Can also play V5 (Industry Spotlight) at the end of the project once project is wrapping up



- While other groups are testing, groups to clean up workspace
  - Up to teacher: some students may prefer to bring home bridge as souvenir instead of test/break it
- Award the engineer of the week sticker(s)



# Extension Activities:

Check out the following options to lengthen or compress this lesson.



- Return after first test to improve project
- Decorate project
- Film tests in Slo-Mo and analyze
- Watch additional videos related to Biomedical Engineering
- Use a different material to build a 2nd bridge & compare



- Skip testing portion
- Students can closely copy one of our designs for their own
- Students / groups ahead can help others who may be behind

# Optional Supplements:

Check out our activity guides, quizzes, and more on the project page to see if implementing those makes sense for your classroom!

## Social-Emotional



### RELATIONSHIP SKILLS

STIIX activities ideal for working in teams of 2-3 solving practical problems together.

### SOCIAL AWARENESS

For open-ended challenges, different people have different ideas. How can we decide on the best one, or better yet, combine thoughts?

### RESPONSIBLE DESISIONS

Our materials are age appropriate, but also need to be used safely and responsibly. Students' teams are counting on them to bear that responsibility and contribute.

### SELF MANAGEMENT

The Engineering Design Process creates ups and downs throughout the project. How do the students handle the inevitable obstacles and victories?

### SELF AWARENESS

Our projects introduce students to some of the hottest STEM career fields. Our hope is they resonate with a project and spark a passion for a future career field!

## Reading / Writing



Task students with some reflection questions from our provided 'Follow Up Quiz', or reinforce some topics through our activity guide handouts.

Both are found in the 'Resources' tab on the project page.

