



STIIX™

# Lesson Plan

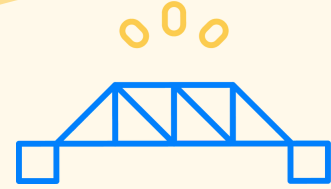
Hey there!  
My name is Alex Reader and I am the founder here at STIIX.



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.

## Bridge Project



**Topics: Force, Stress**

**Career Exploration: Civil Engineering**

**Length: 2-3 Hours**

**Teams: 1-3 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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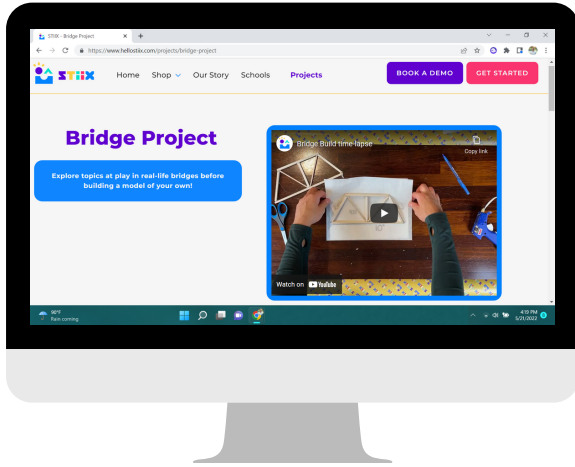
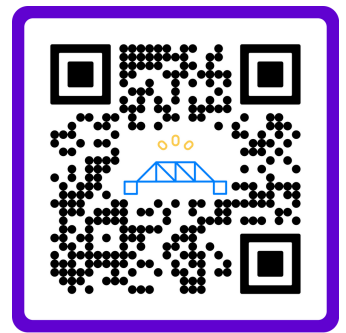
## The Engineering Design Process



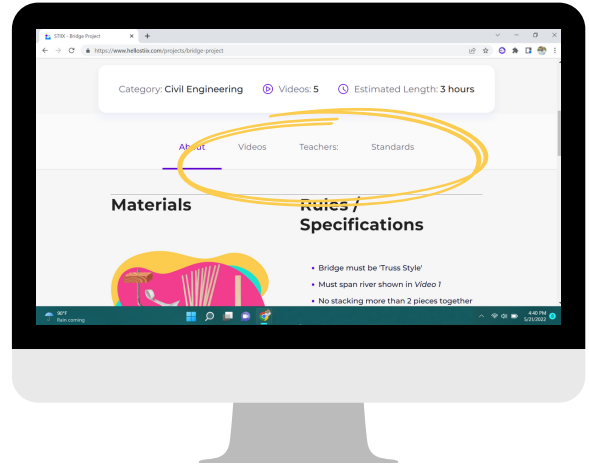
# So where do I start?

In case you have not found it already, you will want to navigate to the BRIDGE 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:



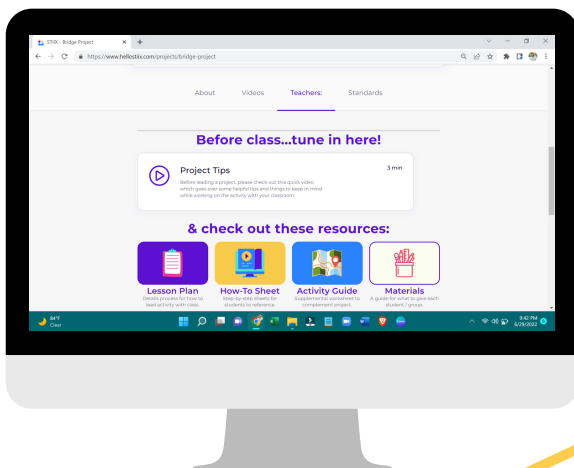
If you see this, you are in the right place



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!

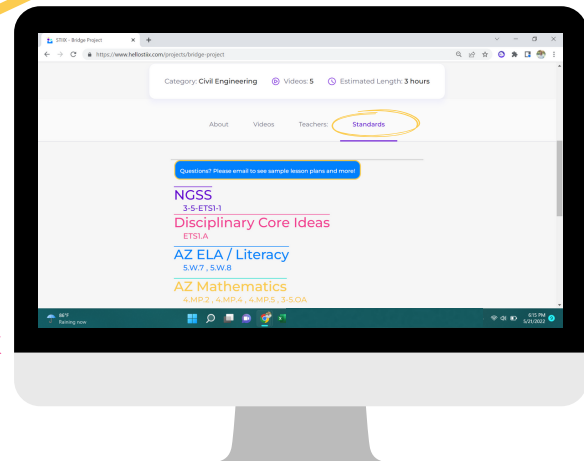


Be sure to check out our TEACHER TIPS VIDEO that we make for each project. In them, we detail helpful insight for how to best lead the project at hand!

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..



# Bridge Project Objective:

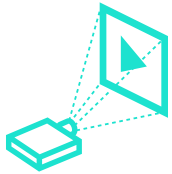
Students are to design and build a truss-style bridge out of balsa wood before testing its strength. The context takes place in STIIX-Ville where the expanding city needs transportation over a river that is currently land-locking the community.

# Key Vocabulary

Please keep an eye & ear out for the following vocab words:

**Force, Truss, Stress, Member, Joint, Gusset Plate, Infrastructure**

# The Process:



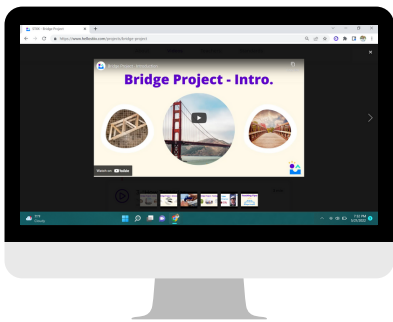
## 1. Project & Play Videos (10-15 mins.)

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

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

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!



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

- Break up into teams of 1-3
- Prompt them to recollect our task
- Get ideas / design solutions down on paper
  - Templates of reliable designs are provided for students struggling with this step
- 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 it looks to be an appropriate design and is made up of triangles!



## 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.

- x1 Pack of Balsa Wood Sticks
  - 1/4" sticks (x11)
  - 1/8" sticks (x10)
  - Ruler style stick (x1)
- x4 Binder Clips
- Glue Dots
- x2 sheets parchment paper

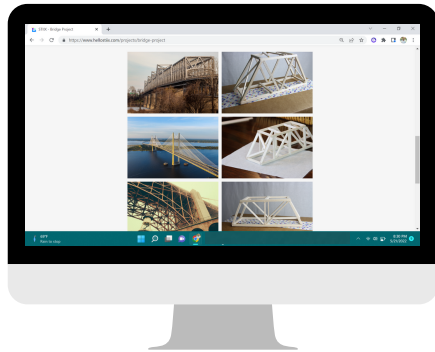


### Shared / Group Mats.

- Bridge Templates
- Testing Mechanism
- 5 Gallon Bucket
- Kitchen Scale
- Hot Glue
- Markers to draw design ideas
- Newspaper Sheets

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

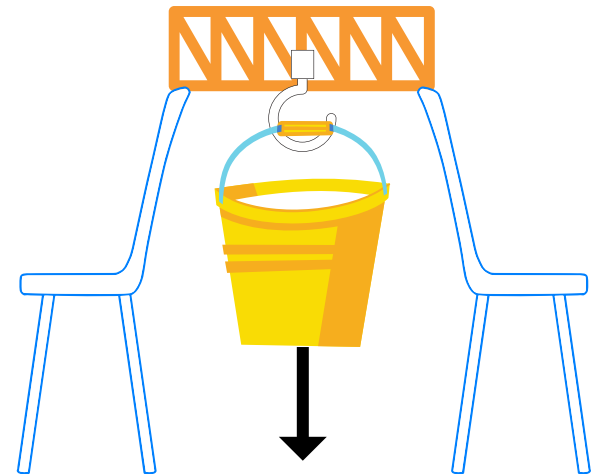
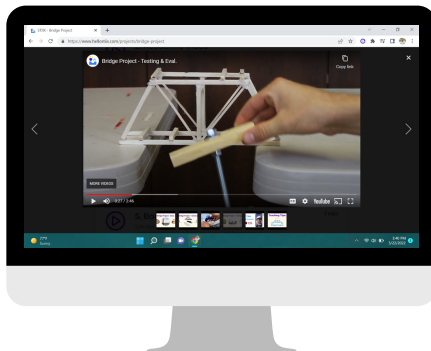
- Pass out "Step-by-Step" sheets
  - If students ask you questions, ask them if they have referenced the sheet before you answer/help them
- Optional: Leave the "Gallery" section of the project page up while students are building



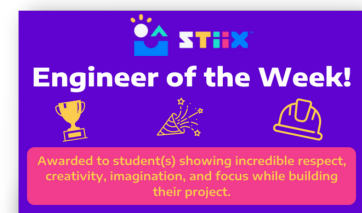
- Hot glue guns will be used
  - Make sure students are wearing gloves while using it & working over newspaper sheets to prevent a mess
- If project will carry over into another day, have students write name on bridge or sheet of paper all their supplies are on

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

- Follow testing instructions per the 4th video
- Optional: Have students calculate the 'Structural Efficiency' of their bridge (weight held / weight of bridge)
- 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.



- Students apply additional tips to strengthen bridge
- Decorate bridges
- Film tests in Slo-Mo and analyze
- Watch additional videos related to bridges
- Use a different material to build a 2nd bridge & compare



- Skip testing portion
- Students can use one of our templates for their design
- Students ahead can help out 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 DECISIONS

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

**Bridge Quiz/Follow Up**

1. What caused all of the bridges in America to be destroyed in the 1700s?
2. What were the three materials bridges have been made of over the years?
3. What is the strongest shape in the world?
4. The purpose of a truss is
5. What is structural efficiency?
6. Write a 3-5 sentence paragraph detailing something new you learned about bridges. Also include the structural efficiency of your bridge as part of your answer:

**Bridge - Activity Guide**

Structural Efficiency Calculator

Weight My bridge held: \_\_\_\_\_

Weight of my bridge: \_\_\_\_\_

Structural Efficiency: \_\_\_\_\_

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.

