Lesson Plan

Stoplight Project
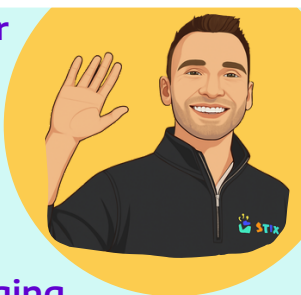
Hey there! My name is Alex Reader (great last name for working in education, right?😌) & I am the founder here @ STIIX.

I am a former Engineer & Teacher, and I have a huge passion for bringing meaningful STEM experiences to students.

If this is your 1st STIIX lesson / project, we want to say thank you! We hope both you & your students enjoy the hands-on activities, and please know we are here to offer any support along the way.

Topics: Electricity, Circuits
Career Exploration: Electrical Eng.
Length: 1-2 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 fun activities like this, 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 and to share all the helpful resources we provide to help make this activity a smooth, memorable, & impactful one!

If any question pop up at all after scanning through, please do not hesitate to call or email!
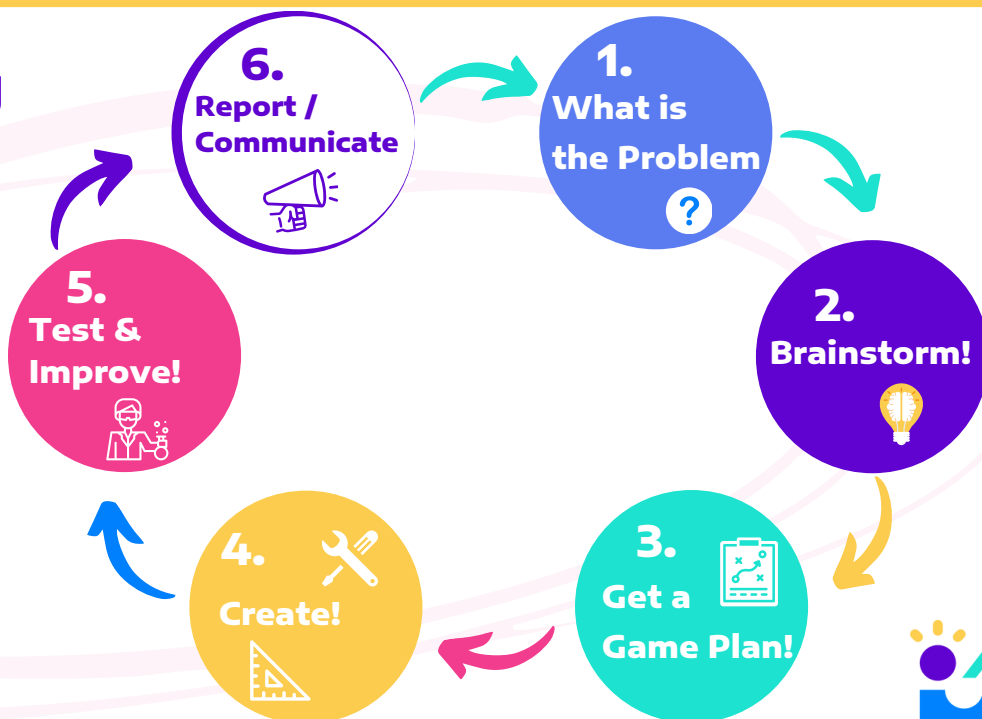
📞 480.747.7852   ✉ Info@hellostiix.com

The Engineering Design Process

6. Report / Communicate

1. What is the Problem ?

2. Brainstorm!

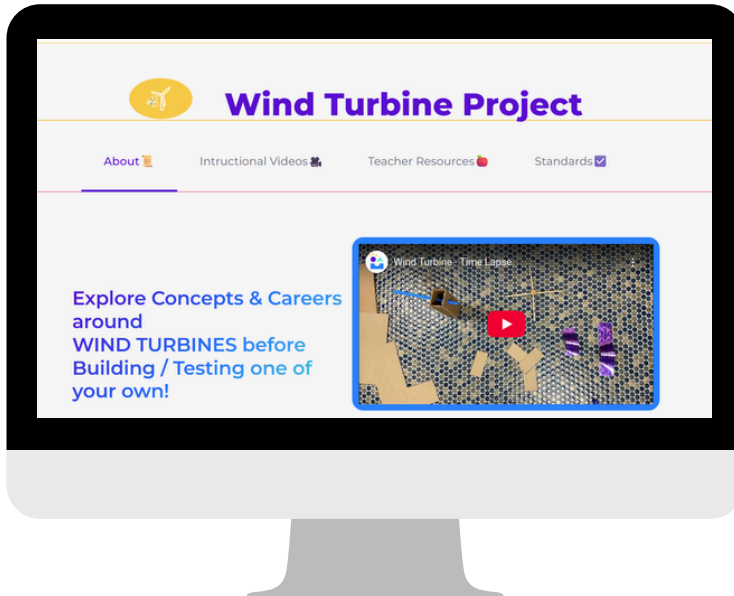3. Get a Game Plan!

4. Create!

5. Test & Improve!

So where do I start?

In case you have not found it already, you will want to navigate to the <u>Stoplight</u> Project Page.

To locate it, click on the <u>"Projects"</u> tab on our website <u>(www.hellostiix.com)</u> and click the 🚦 icon, or feel free to scan this QR code:

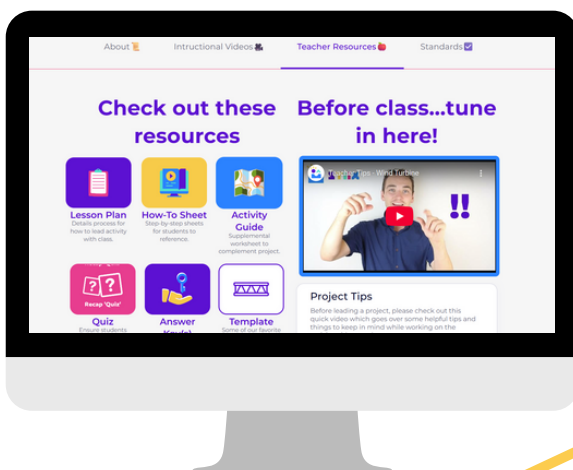If you see something like this, you are in the right place!👍

Wind Turbine Project

About 📃   Intructional Videos 🎬   Teacher Resources 🍎   Standards ☑️

Explore Concepts & Careers around WIND TURBINES before Building / Testing one of your own!

Wind Turbine - Time Lapse

These tabs are where all the magic happens:
- **"About📃"**
  - See general info. examples, a timelapse, etc.
- **"Videos🎬"**
  - These are the student-facing instructional videos
- **"Resources🍎"**
  - A digital copy of this LP, along with other resources for teachers are housed here.
- **"Standards☑️"**
  - Peek here at some of the standards this activity aligns with.

Beforehand:

Don't worry, preparation is super minimal! We want to make this the easiest way possible for you to lead a meaningful STEM lesson🙏

About 📃   Intructional Videos 🎬   Teacher Resources 🍎   Standards ☑️

Check out these resources

Lesson Plan
Details process for how to lead activity with class.

How-To Sheet
Step-by-step sheets for students to reference.

Activity Guide
Supplemental worksheet to complement project.

Quiz
Ensure students

Answer Key(s)

Template
Some of our favorite

Before class...tune in here!

Teacher Time - Wind Turbine

Project Tips
Before leading a project, please check out this quick video which goes over some helpful tips and things to keep in mind while working on the

Be sure to check out our <u>TEACHER TIPS VIDEO</u> that we make for each project. In them, we detail helpful insight for how to feel comfortable & confident going into the project with your group.

1.

2.

Wind Turbine Project

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NGSS

- 3-5-ET5
- 4-PS3-
- MS-PS

Sunshine State

- SC.8.N.4.1

NGSS 3-5-ETS1   ✕
Age / Subject
3rd-5th / Engineering Design

Description
Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

CTE-STEM.68.TE.2.1

Our projects align with some of the latest national standards. Click through the <u>'Standards'</u> tab to see how the content meshes with your grade band & initiatives.
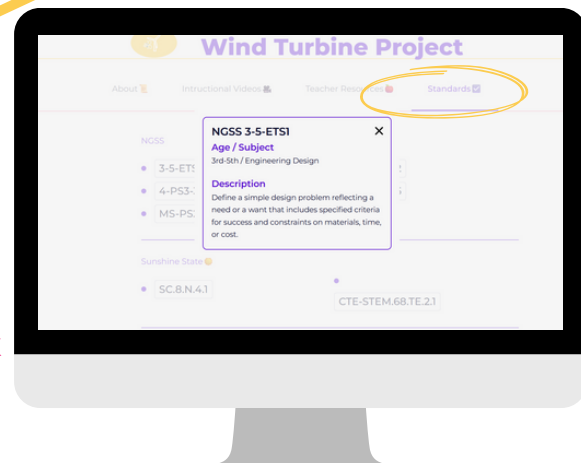
Project Objective:

Students will apply principles of electrical circuits, sequencing, and design to build a functioning model stoplight using LEDs and basic wiring.

Set in the rapidly expanding city of STIIX-Ville, students take on the role of electrical engineers tasked with helping develop a safer, more efficient traffic system. Through this real-world simulation, students will explore circuitry, logic flow, and infrastructure needs while documenting their engineering process and evaluating the performance of their traffic light systems.

Although this specific project is not on there, check out our optional Augmented Reality app, STIIX-Ville. In it, students can bring concepts & careers to life for 6 other of our other STIIX projects.🏙️

The Process:
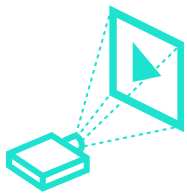
1. Project & Play Videos (10-15 mins.)

STIIX has a series of 5 videos we play for the students to introduce the project & how to go about building it. We like to project these at the front of the room.

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

Optional:
- Have students take note of any questions, potential challenges, unfamiliar terms, etc. they encounter during the video(s)
- Pause when prompted to discuss the inquiry-based learning questions!

Stoplight – Introduction Video

1. What is the Problem ❓

This step provides some context, immerses students into a story, and introduces the "Problem / Scenario at hand"

2. Group up & Brainstorm (~15 mins.)

- Break up into teams of 1-2
  - If >2, standing around can tend to occur
- Prompt them to recollect our task
- Get ideas, design solutions, & roles written down on paper
- Use this as thinking time... encourage groups to talk to partners, ask questions, <u>THINK BIG</u>!
  - The temptation is to rush through this step...we strongly encourage groups to be thorough and take this step seriously (building the foundation).
- 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. Get a Game Plan!

Here is the students' chance to Brainstorm + Get a Game Plan

2. Brainstorm! 💡

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 LED Lights ↻
- x1 Wood Base ↻
- x1 Foam Tower ↻
- x1 Foam Horizontal Piece ↻
- x1 Battery ↻
- x4 Wires w' Clamps ↻
- x1 Strip Copper Tape ↻
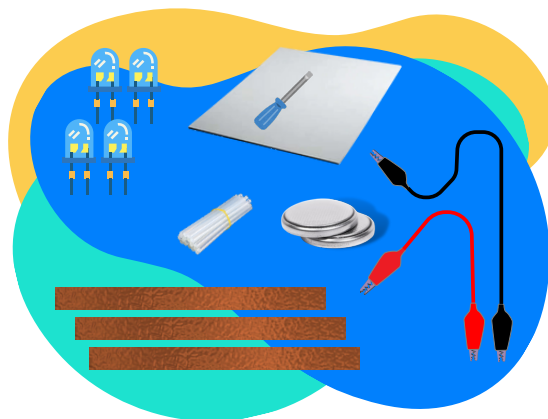
Shared / Group Mats.

- How-To Sheets
- Hot Glue ↻
- Mini Screwdriver
- Newspaper Sheets

↻ **=** **Included in Refill Kit**

Friendly reminder that not all of the materials are REQUIRED to be used ...but rather, this is what they have at their disposal as they design their project.

4. Get to Building (45 mins - 1.5 hrs.)

- Pass out "Step-by-Step" sheets
  - Should have a couple of copies printed in kit.
  - If students ask you questions, ask them if they have... #1. even attempted yet -AND/OR- #2. If they have referenced the instructions before you provide help.
- Optional: Leave the "Gallery" section of the project page up on the projector while students are building.
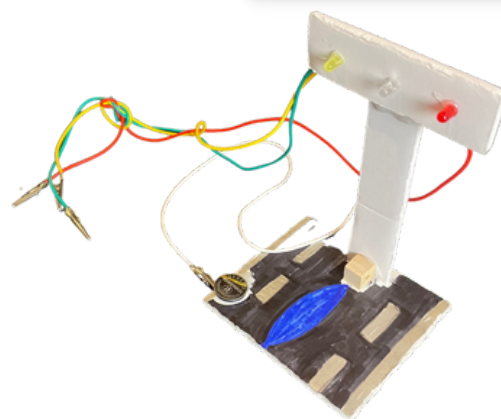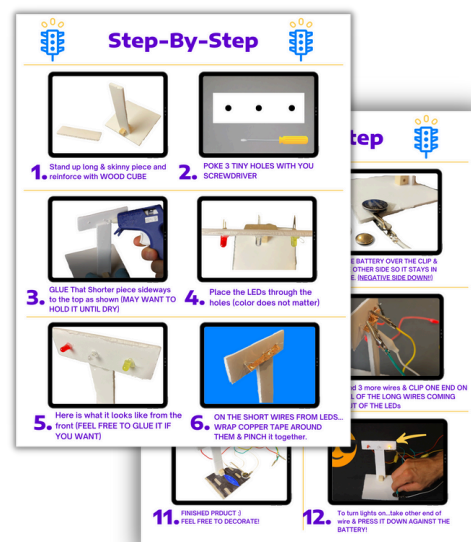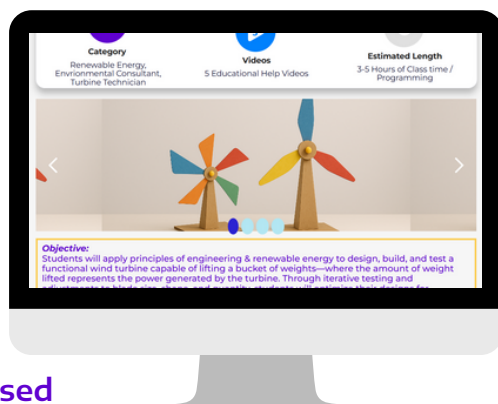
- Hot glue may be used
  - Make sure students are wearing gloves while using. Working over newspaper sheets will also prevent messes.
- If project will carry over into another day, have students write names on their materials / work.
- Typically students do not finish in one day...anticipate students to get partially through the "Build" section and pick up where you left off next time!
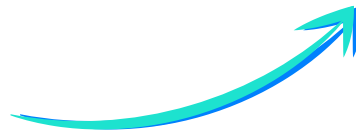
5. Testing / Cleanup (~15 - 30 mins.)

- Follow testing instructions per the 4th video
- Optional: Turn the lights off!
- You can also play V5 (Industry Spotlight) at the end of the project once project is wrapping up
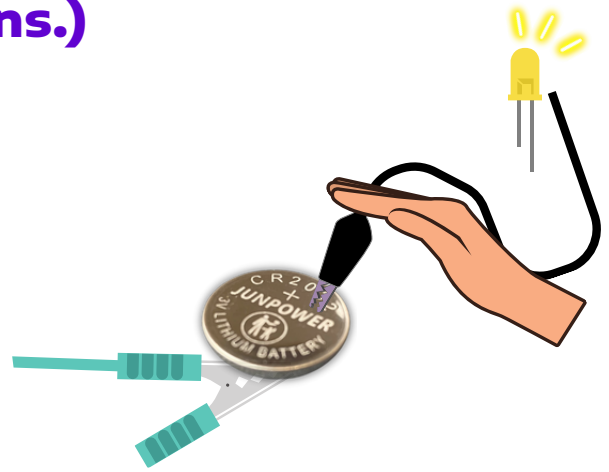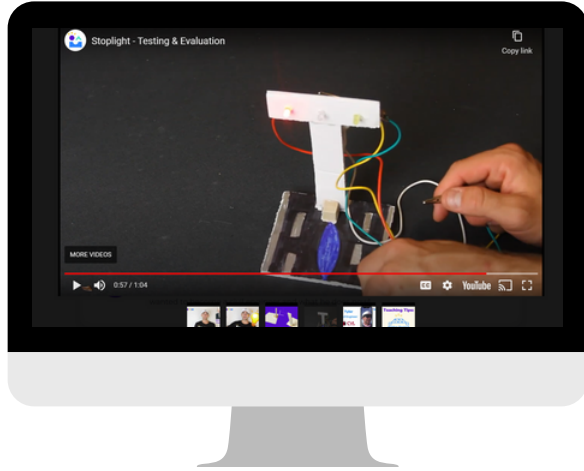
- While other groups are testing, finished groups should begin cleaning up workspaces.

- Award the "STEM-MVP" sticker(s)

STiiX
STEM-MVP
Awarded to students showing exemplary Creativity, Imagination, & Respect while designing / building their project.

5.
Test & Improve!

Key Vocabulary

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

Electrical Energy, Current, Wire, LED, Circuit, Electrical Engineering, Battery, Copper

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Extension Activities:

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

- Decorate Projects
- Improve functionality of Stop Light after testing it out
- Watch additional videos related to Circuits or Stop Lights

- Focus on one Light before doing all 3
- Have Students work in groups

Optional Supplements:

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

Social-Emotional

Social & Emotional Learning

- **Self-Management** – Managing emotions and behaviors to achieve one's goals
- **Self-Awareness** – Recognizing one's emotions and values as well as one's strengths and challenges
- **Social Awareness** – Showing understanding and empathy for others
- **Responsible Decision-Making** – Making ethical, constructive choices about personal and social behavior
- **Relationship Skills** – Forming positive relationships, working in teams, dealing effectively with conflict

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

SOCIAL AWARENESS
For open-ended challenges, different people have different approaches / 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.
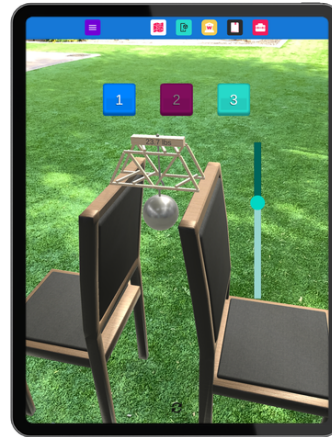
SELF MANAGEMENT
The Engineering Design Process creates emotional ups and downs throughout the project. How do the students handle the inevitable obstacles and victories?

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!

STIIX-Ville

Although this project is not one of the 6 STIIX projects on the app, check out the amazing content, resources, and activities we have on there to bring some cutting-edge technology to this project!

Reading / Writing / Presenting

Task students with some reflection questions from our provided 'Follow Up Quiz', or reinforce some topics through our 'Activity Guide' handouts.
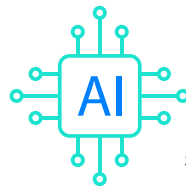
If you are looking for helpful extensions, try this prompt into your favorite AI Chatbot 😊

"I just did a [Project Name] STEM project with my [grade level] students. Can you find me articles, videos, and/or publications that are age-appropriate and help extend or reinforce the core concepts of the project? I'm especially looking for resources that connect this topic to real-world applications, careers, or current innovations."

- **Optional....** "...that align with NGSS for {Grade}" -OR- "...with a focus on {your focus}." -OR- "...including YouTube videos, interactive websites, or kid-friendly news articles." -OR- "...that I can use as a pre-project hook or post-project extension."