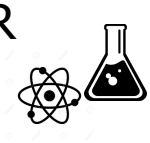
WESTLAKE SCIENCE & ENGINEERING FAIR

ENGINEERING PROJECT WORKBOOK

Thursday, February 26, 2025



The Westlake Science & Engineering Fair gives Westlake students an opportunity to learn more about a topic they are interested in, gain valuable skills on the scientific process, develop creativity, organizational, critical thinking skills, and so much more! This packet will help guide you & your child through an **ENGINEERING PROJECT**. *Not an experiment based project!*

WHO CAN PARTICIPATE? ALL Westlake students!

WHO SUPERVISES? This is an at-home project supervised by a mentor. Each student needs a mentor to help them through the organizational components of the project. Mentors are an essential part of the science fair project and work as a **guide** from start to end.
✷ **Note to mentors:** Your role is to help students translate their interests into a scientific experience. You will help students navigate the steps of this process. Resources and examples to help you through this process can be found online at:
http://www.supportwestlake.org/science-fair.html

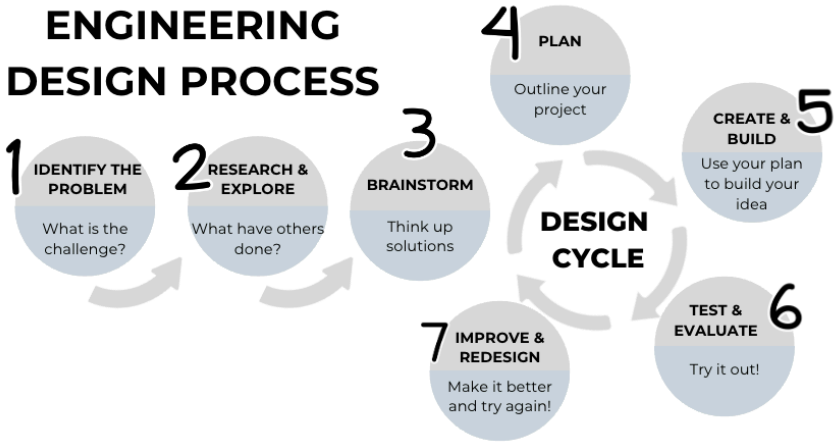
MARK YOUR CALENDAR

Before you get started, get organized, look at your calendar and create a timeline that works for you. Fill in the "Goal Date" column below then add dates to each section of the packet.

Goal Date	Suggested Duration	STEPS TO COMPLETION
	1 week or less	Find a mentor
	1 week	Choose a question or problem
	1 week	Build understanding by asking QUESTIONS & doing RESEARCH
	1-2 weeks	Brainstorm problems you want to solve, collect materials
	1 day	Define the problem and name your solution
Thurs. Dec. 18 **Thurs. Jan 15** **Wed. Feb 11**		After School: Pick up your poster board in the MUR *Participants must be registered prior to pickup*
Tues. Feb 10		**REGISTRATION CLOSES** - **Register online** http://www.supportwestlake.org/science-fair.html
	1-2 weeks	Create and build your idea, run tests
	1 week	Collect & interpret your data, improve your design
	1 week	Design your poster board
	1 week	Practice your presentation
Wed., Feb. 25th		**Set up your Project in the MUR after school (12:15-1:15)**
Thurs, Feb. 26th		**WESTLAKE SCIENCE FAIR** 8am-12pm judging, 5:30-7pm Open to Families
Fri, Feb 27th		Pick up your board & presentation **after school**
Sat, March 28th		**County STEAM Expo** (Register by March 2nd)

ENGINEERING PROJECT WORKBOOK

Let's Get Started!



An **Engineering Project** involves finding a problem, designing a solution to that problem, then testing and revising your project to determine the most effective solution.

This guide will lead you through the steps to a successful project. Remember you need to write down all your ideas and progress in a **notebook** or use the worksheet at the end of the workbook and paste that in your notebook. The 📖 icon will remind you to make a new **notebook entry** with a Title and Date. Use the ☑checkboxes to mark your progress.

SECTION A: FORM YOUR IDEAS

Before you start . . . Find a Mentor! *Goal Date:* _____

A mentor should be …

- ➢ Someone comfortable guiding your scientific thinking
- ➢ Willing to talk with you multiple times over the course of the project
- ➢ Someone who will keep you on track, organized and help you access the online resources at http://www.supportwestlake.org/science-fair.html

My mentor is _____

Judges might ask you:

- *Who helped you with your project?*
- *In what parts of the project was their help most useful?*

✋*STOP! Make sure you have a Mentor before you continue.* ✋

Choose a problem you are interested in solving

Goal Date: _____

IMPORTANT RULES: Special project approval is required BEFORE STARTING if you are studying people, vertebrates (animals with bones), handling human or animal tissues or fluids, microorganisms, rDNA, chemicals (cleaning agents, solvents, organic chemicals) hazardous equipment (UV light, rockets), or controlled substances (anything that the student cannot legally purchase). Projects with harmful fungi (mold) or bacteria must be performed in a lab setting.
MENTORS: Email westlake.sciencefair@gmail.com with the potentially unsafe category from the above list and provide a short explanation of how you, as the Mentor, will provide a safe experience for your student and/or others while conducting this experiment.
NOTE: ***Projects that include mold will not qualify for the county science fair***

Your project idea should be ...

- ➢ *Most importantly, something you find interesting.*
- ➢ **A problem** that requires an **engineered solution.**
- ➢ Something based on components that can be measured clearly, such as time, weight, distance, height, volume, things you can count, etc.

📖 **Notebook entry:** *Topics of Interest*

- ☐ Make a list of topics that you find interesting to you
  - 3-5 topics I am interested in are _____.
- ☐ Talk to your mentor about possible ideas to pursue based on this list.
  - The topic I am most interested in is _____ because _____.

📖 **Notebook entry:** *Engineering Problems to Solve*

- ☐ Brainstorm problems you want to solve.
- ☐ Choose a problem that you can design a solution for
  - Think: Can I measure it? Can I get the materials? Will it help people?
  - Sketching out your ideas might help!
  - *How might (idea I could engineer) help solve (problem or challenge)?*

The problem I am trying to solve is:

_____

_____

💡*Your initial question may change as you go through the research process!* 💡

Judges might ask you:

- *How did you come up with the idea for your project?*
- *What questions did you have about your topic that you needed to answer?*
- *Do you think your project will help people?*

Build understanding by EXPLORING & doing RESEARCH

Goal Date: _____

Before you begin your project, you will need to learn more about your topic. This could be done through playing with your ideas and materials, talking with people/experts or learning more through research.

📖 **Notebook entry:** *Research & Explorations*

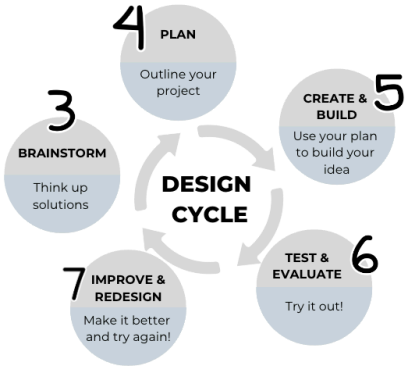
- ☐ Write down what you already know about your topic. (Personal stories, things you've seen, watched or read). These are your *prior experiences*.
- ☐ With the support of your mentor, gather information about your topic.
  - Play around with your ideas to learn more and see if there are surprises
  - Have conversations with people or experts in your field
  - Do research with books, videos, or websites
  - Write down important questions you have about your topic
- ☐ Keep a list of the resources you used in your research.

💡*As you learn more, revise your original problem if needed!*💡

Judges might ask you:

- *What prior experiences did you have with these ideas?*
- *What ideas did you learn while doing your research?*
- *What resources were most useful for you in your research?*

SECTION B: DESIGN CYCLE



Design cycle is the process of testing then adjusting the solution to your problem. You will cycle through steps 3-7 several times as you test and improve your solutions. Use the form at the end of this packet to help you through this process. You can tape this sheet in your notebook. More resources can also be found online: http://www.supportwestlake.org/science-fair.html

Brainstorm ways to SOLVE your problem

Goal Date: _____

📖 **Notebook entry:** *Brainstorm*

- ☐ Using what you know to brainstorm ways to solve your problem
- ☐ Draw your ideas or write down your thoughts as you imagine solutions
- ☐ Do some research if you get stuck.

Plan your project

Goal Date: _____

Now that you know more about your topic and have ideas on how to solve it, it's time to make a plan that describes how you will carry out your project.

📖 **Notebook entry:** *Project Outline*

- ☐ Explain each part of your engineering design project.
  - Define the problem: Explain the situation you're trying to solve.
  - Name your solution: Write your idea for a solution to that problem.
  - Explain how you will know it works: Name a few things that you will use to measure the success of your solution.
  - What will you Measure to show proof of it working: Measurements you will take to evaluate your design solution.
  - Make a prediction: What do you think will happen?

See examples at http://www.supportwestlake.org/science-fair.html

Judges might ask:

- *How did you design a solution?*
- *What steps did you take to ensure someone else doing the same investigation could get the same data/ results?*
- *What proof do you have that your project works?*

Create and build your idea

Goal Date: _____

📖 **Notebook entry:** *Materials*

- ☐ List the materials you will need for your project.
- ☐ Collect your materials. Talk with your mentor if you need to purchase anything.
- ☐ Take a picture of your project.

Run your test, collect and interpret your data

Goal Date: _____

📖 **Notebook entry:** *Data and Observations*

- ☐ Write down your observations
  - *I notice _____.*
- ☐ If you collected data, make a display of your data (graph, chart) to help you understand and communicate the results. Remember to include the unit of measurement!

📖 **Notebook entry:** *Results*

- ☐ Explain what happened and **why**.
  - Was your hypothesis supported or not supported?
  - Was your solution successful? Why or why not?
  - If you are unsure, discuss with your mentor or do more research.
  - Use words or drawings to describe your thinking. Refer to the science you learned through your research.

Improve your design

Return to step 3 and make improvements. We recommend 3 design cycles.

Judges might ask you:

- *What challenges came up when you were doing your engineering cycles?*
- *How many design cycles did you do (tested, modified, re-designed)?*
- *Did you do any calculations during your project?*
- *How would you explain your results?*
- *Could your results be based on random chance? (hint: how much data did you collect? More data = less chance) Why or why not?*
- *What surprised you about the results of your work? Did the results match your predictions?*
- *Did the results change your way of thinking about the situation? How so?*

SECTION C: FINAL STEPS

Step 8: Draw Conclusions and Reflect *Goal Date: _____*

📖 **Notebook entry:** *Conclusions*

Construct an explanation of your results *based on your research and understanding of science.*

- ☐ How have your ideas changed based on what happened?

📖 **Notebook entry:** *Reflections and Next Steps*

- ☐ What went well with your tests?
- ☐ What challenges did you have? Were there mistakes/ errors?
- ☐ List new questions about your topic based on your results.
  - *I wonder _____.*
- ☐ What needs more research/ experimentation to deepen your understanding?
  - *I'd like to know _____.*
  - *If I had more time I would _____.*

Judges might ask you:

- *What new questions did you have after you collected your data?*
- *Would it be valuable to collect more data? Why or why not?*
- *How could your project help people?*

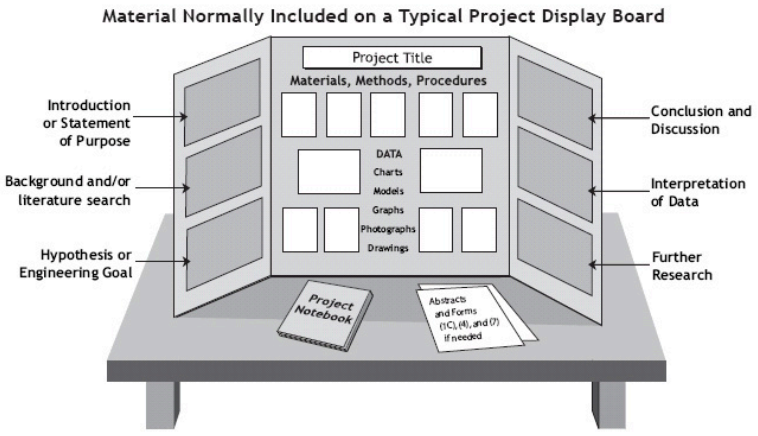
SECTION D: SHARE YOUR PROJECT

STEP 9: Design a Poster Board Presentation *Goal Date: _____*

Design a poster board to tell the story of your project. Use your creativity and have fun making your board! Projects may be typed or handwritten, all writing must be NEAT and LEGIBLE. There is no one way to make a poster board, but be sure to include the sections listed below.

- ☐ Pick up a poster board from the MUR after school on **Thurs. Dec 18th, Thurs. Jan 15th, or Wed. Feb 11th** (*Participants must be registered prior to pickup*)
- ☐ Neatly write or type your:
  - Problem and Purpose
  - Research. List a few things you learned and your sources (from step 2)
  - Materials (from all design cycles)
  - Design Cycle One: Procedure (Plan from step 4), Hypothesis, Results (Data Tables, Charts, Graphs that include captions)
  - Additional Design Cycles (How did you redesign? What were your results? Did it improve your project?)
  - Conclusions & Next Steps
  - Acknowledgements
- ☐ Think of a title for your project
- ☐ Make sure titles, subtitles and text are large enough to read
- ☐ Arrange all parts on your poster board - make sure they fit before gluing down!
- ☐ Remember to bring your notebook!
- ☐ Include props or samples (if possible) so people can interact with your project. Electricity will not be provided. You will only have 1x2 feet of table space in front of your display.

EXAMPLE BOARD:



Judges might ask you:

- *What was one of the highlights of your project?*
- *What was a challenge you faced?*
- *If you did this project again, is there anything you would do differently?*
- *If you decided to work more on this idea, what would you do next?*

STEP 10: Practice your Presentation *Due date: _____*

Have your mentor and other adults ask you questions about your project. Go back through this packet and check out some of the questions judges might ask you to help you prepare.

STEP 11: Acknowledge your helpers

📖 Notebook entry: *Acknowledgments*

Congratulations, this is the last entry in your notebook! Write a few sentences about who helped you and how they helped you.

Judges might ask you:

- *Who helped you on your project?*
- *Which parts of your project did you receive help with?*

Looking forward:

How does Judging Work?

1) You will be called out of class and 3 judges will talk to you about your project.
2) The judges will complete the rubric (to help evaluate your project) as well as a paper feedback form for you. Rubrics & feedback forms are on the following page.
3) There are two judging divisions: TK-3 and 4-5. All projects that meet county requirements will receive an "Exceptional Project" certificate and are recommended to compete in the county science fair.

** If your project does not receive a recommendation to go to the county, you can STILL attend the county science fair by making the recommended changes to your project. Email the committee a picture of your board if you have specific questions.*

Save the Date! The Santa Cruz County Science Fair: March 28th

Register for the county STEAM Expo online BY March 2, 2026 to participate.

More information can be found online at: https://sites.google.com/santacruzcoe.org/santacruzsteamexpo/home

DESIGN CYCLE NOTES

Use this worksheet if it is helpful! Feel free to cut this out and put it in your notebook.

Design Cycle Worksheet (steps 3-7)		
Step 3	Brainstorm: Draw your ideas and make some notes	
Step 4	State the problem	
	Name the desired solution	
	Explain how you will know it works	
	What will you measure	
	Predict what will happen (Make a hypothesis)	
Step 5	Create and Build your idea. List the materials you need.	
Step 6	Run a test of your model and write down observations	
	Record your data	
Step 7	**Improve your Design** Go back to Step 3 and perform another Design Cycle We recommend you perform 3 Design Cycles.	