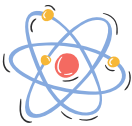




Project-Based Learning Guidebook

What is project-based learning (PBL)?

Students engage in a long-term project to find solutions to complex real world problems or answer complex questions that are personally meaningful to them.



Students become the driver of their learning while the instructor becomes the navigator.

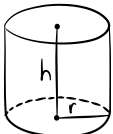
Content delivered in context of project. Practical activities used to acquire knowledge. Tangible products and presentations used to demonstrate/evaluate knowledge

Offers students choice and agency by engaging them in self-directed activities.



There is no one way to do PBL!

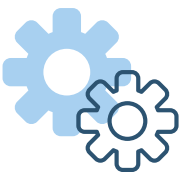
“Project-based homeschooling can look differently as my child grows and becomes more independent and capable of working on his projects without my direct assistance!” - Mama of Letters



$$V = \pi r^2 h$$



Gold Standard of PBL

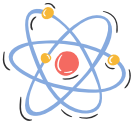
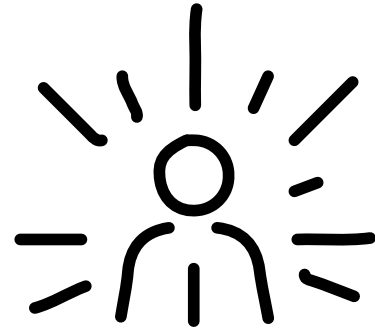




The Gold Standard of PBL for Homeschool Students

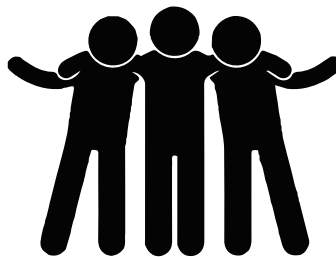
Challenging problem/question that has authenticity and relevance

Students start with discovery of what they already know about the topic. Encourage them to share how they might be connected to it. Do they have prior experiences that link to the topic? Mind maps and personal connection maps are great for this. If they don't know much about the topic, seize that feeling of discontentment and energize them to find answers through research and experiments.



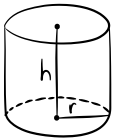
Group work & collaboration

Make your project a group project with other students from HSDs, your neighborhood, friends, family, homeschool groups or co-ops. You can even make this project part of your co-op meetups.



Critique & revision

Provide students with a rubric. Students can give and receive feedback on the quality of their work, leading them to make revisions or conduct further inquiry. This can be done with other family members, friends, or other homeschooling families



$$V = \pi r^2 h$$

Student voice & choice

By giving students a choice in how they learn, instructors can empower students to see learning as something that plays to their strengths instead of exposing weaknesses. Use Choice Boards to write down their questions, remind them what they wanted to know, document their work, and schedule dedicated project time. Make suggestions when they get stuck.



Sustained Inquiry

Encourage students to continue questioning each data point they examine or reaction they observe all throughout the duration of a lesson or activity.



Reflection

Reflections can take the form of discussions with the instructor, a conversation between two students, a written reflection, podcasts, posters, drawings, or even video reflection where students focus on their process and outcomes.



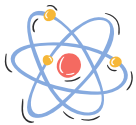
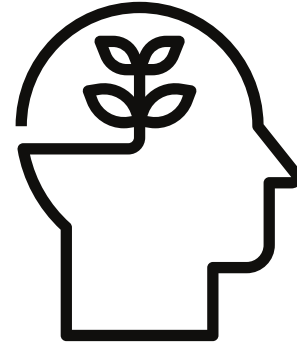
Public Product

Science Mill Mentors will help your students refine their project and public speaking skills so that they are ready to present their final product to an audience. You can support them at home by hosting mock presentations with friends and family or by having them explain their project to you so they are comfortable talking about it.



What PBL is NOT!

1. Rote memorization of facts
2. Individual work
3. Passive learning
4. Abandoning all aspects of traditional learning/instruction
5. Doing the project for the student
6. Controlling student ideas or process
7. Holding back feedback
8. It's not a one-and-done
9. It is not a "dessert project"



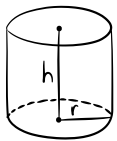
"Doing a Project" vs. Project Based Learning



DESSERT
"DOING A PROJECT"



MAIN COURSE
PROJECT BASED LEARNING



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With "**Dessert Projects**", the project is the dessert - it comes at the end of the learning after all the content has been delivered and student don't spend as much time on it as they do the content. Projects are typically teacher-directed, highly-structured, summative, exercises with clear answers: "Size this beam" "Develop a market report" "Make a shoe-box diorama."

With Project-Based Learning, the project is the "**Main Course**" and the vehicle for teaching the important knowledge and skills students need to learn. It uses an open-ended, inquiry-based approach to problem-solving: "What are the most effective attributes of a sustainable building?" "How can literature be a vehicle for social change?"

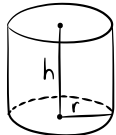


Key Instructor Practices

No matter what, families are essential partners in a child's STEM learning success.

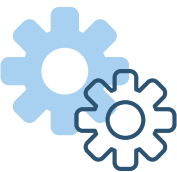
Give up control	Open yourself up to the learning process. Share with your students that you will be learning alongside them.
Build culture of inquiry and exploration	Question students when they are curious about something, don't just tell them the answer. "What did you notice?" "How do you think that works?" "Where would you look for solutions or causes?"
Hold students accountable	Write down their questions, remind them of what they wanted to know and accomplish, document their work, schedule dedicated project time, and make their work visible. Doing this sends a message that their work is meaningful to you and to them.
Try new modes of learning	Try field trips, online research, videos, podcasts, games, movies, performances, museums, libraries, interviews, classes, art, and even road trips.
Make learning fun & relatable	Guide your students to consider STEM in relation to who they are. "How do you see yourself while doing STEM?" "What do you think and feel while doing STEM?" "What are your hopes for learning STEM?"

Homeschool PBL Examples:



$$V = \pi r^2 h$$

- **K-2:** Jayden prefers when his dad's pancakes because his mom's don't taste as good. He wants to help his mom make pancakes just like his dad. Over the next few weeks, Jayden's dad teaches him about fractions, measuring, simple machines, circuitry, and chemical reactions. After a month or so of practice, Jayden teaches his mom how to make the perfect pancakes and feels proud that he knows how to make pancakes now too!
- **3-5:** Jordan wants to be a plant expert, but has a hard time identifying different plants. Jazmyn has been reading a book where a robot with Artificial Intelligence helps a boy with his chores, but she doesn't understand how the robot does it. Their lessons then dive into local ecology and AI. Jayden is tasked with identifying and labeling all the plants in their backyard while Jazmyn was introduced to Google's Teachable Machine to explore how to teach Google the plants her brother identifies.
- **6-8:** With a passion for fashion and anime, Alexa wanted to make her own dress for next year's Comic Con. Her mom framed her STEM lessons around measurements of dimensions, circuitry, e-textiles (computer coding), how to use a sewing machine, and even reached out to local tailors and textile-savvy friends to help teach Alexa the basics of making a dress. Alexa successfully made a dress just in time to wear it to Comic Con.
- **9-12:** A group of teens saw the need to create a space where their community could go to get out of the streets. They decided to restore an abandoned lot into a community garden. They surveyed the lot, made conceptual plans, collected data, and met with community experts, activists, professionals and businesses. Students coordinated a Community Day and invited their family, friends, and local businesses to build the various components of the garden





Design Thinking

Step 1 - Identify

Figure out a problem that exists that you may be interested in solving. This could be a problem that affects you, your friends or family, your community, people across the globe, or the environment.

Step 2 - Empathize

Empathy is the ability to understand and share the feelings or experiences of another. It involves talking to people and doing research to uncover their needs.

Step 3 - Imagine

This is where you can explore wild ideas for what you can do or make to solve the problem you identified. Think of all the possibilities, think outside the box. There are no "bad" ideas!

Step 4 - Plan

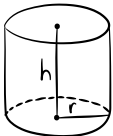
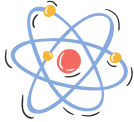
Create blueprints, diagrams or drawings, and lists. Make a list of materials or resources you think you will need. List out the tasks you need to complete. Make a schedule for completing each task.

Step 5 - Make/Prototype

Prototyping is getting ideas and explorations out of your head and into the physical world. A prototype can be anything that takes a physical form. It can be a wall of post-it notes, a role-playing activity, an object, a model, or even a storyboard.

Step 6 - Test

Put your prototype into action to see how well it works. This is a great time to get more feedback from others. You test to improve your prototypes and solutions, to learn more about your user, with the goal of improving your design.




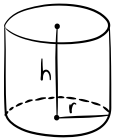
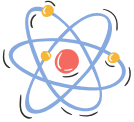
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Resources

Websites	Articles	Videos
PBL Works 	3 Part Homeschool PBL Interview 	Gold Standard PBL in Action 
Project-Based Homeschooling 	Parents as Learning Partners 	Gold Standard PBL Teaching Practices Tutorials 



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