



# pi-top

Templates to get you started with...

## PLANNING YOUR STEAM PROJECT-BASED LEARNING.



# STEAM PROJECT-BASED LEARNING

While project-based learning can be used in any instructional class, be it core, elective, or career and technical education, it almost feels like a natural fit for a STEAM class. And the more we explore and understand PBL, it really does become apparent how well PBL and STEAM strategies complement each other – and research tells us project-based learning in science and math works. Project-based learning allows students to hypothesize, explore, and develop opportunities to change or overcome barriers that affect their ‘real-world.’ We ask our students to think critically and explore solving the driving question.

## Is your STEAM program ready to be rooted in project-based learning?

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### Who are these templates for?

- Classroom Teachers looking to leverage project-based learning in their classrooms.
- Curriculum Directors and Administrators seeking resource options to assist teachers with a project-based learning instructional strategy.
- Anyone needing a starting point to get started with project-based learning planning.

### How do you use these templates?

The templates were designed to support STEAM project-based learning classrooms seeking a starting point, and are generic enough in structure for teachers to use however best fits their needs.

### What's included in this pack?

- STEAM Project-Based Learning (PBL) Checklist
- 16 Questions to evaluate your STEAM PBL
- 9 Steps for getting started with PBL
- Project Plan Template
- Lesson Plan Template (Based on Backwards Design)
- Student Daily Project Log
- Student Engineering Design Process Handout
- Student Engineering Design Process Journal Pages
- Student Graph Paper for Design Prototyping
- Blank Engineering Design Process Rubric



# THE STEAM PBL CHECKLIST

## 16 questions to evaluate your STEAM project-based learning

### Ways to use this checklist:

- Leverage the checklist as a tool to evaluate pre- and post-project-based learning development of activities to determine whether or not they adhere to the goals of a PBL classroom.
- Create professional learning communities (PLCs) to evaluate your district, school, grade level, and/or classroom STEAM programs.
- Leverage the checklist to start grade level conversations around current and future STEAM program goals, initiatives, and instructional strategies.
- As a classroom teacher, use the checklist to evaluate your own instructional practices.

### Questions for evaluation



1	Does hands-on, minds-on learning take place?		
2	Is the STEAM lesson or project tied to specific, measurable learning objectives, big-picture goals, and student engagement outcomes?		
3	Is learning driven by the project through the use of driving question?		
4	Are projects geared towards creating solutions for real-world issues and centered around real-world, real-life applications?		
5	Is the project-based learning lesson or unit multidisciplinary (i.e. cross-curricular)?		
6	Is the project student-centered or teacher-driven?		
7	Does the teacher act as a facilitator?		
8	Do students learn through experience?		
9	Are projects inclusive of – and accessible to – all students, such as English language learners (ELL), special needs and accommodations, etc.?		
10	Can the Engineering Process be found at the ‘heart’ of the project-based learning lesson or unit?		
11	Is the learning less structured?		
12	Do students work in cooperative, collaborative groups?		
13	Are there ample opportunities for students to provide honest, constructive feedback?		
14	Do students produce an authentic product?		
15	Do students present their outcome(s) to authentic audiences?		
16	Does the STEAM program and/classroom provide a makerspace, or a place devoted to student making?		

# 9 STEPS

## FOR GETTING STARTED WITH PBL.



1. Identify standards in which the project will align to and assess.
2. Identify the project topic.
3. Establish the driving question.
4. Plan and create the assessment(s).
5. Determine who will be the authentic audience in which the students are to present their culminating projects and findings to.
6. Provide a project summary.
7. Identify the 21st-century skills and which ones will be assessed or simply leveraged.
8. Establish project duration and timeline of activities.
9. Determine daily lesson goals within the scope of the project duration.

# STEAM PBL PROJECT OVERVIEW

Class	Grade	Teacher
Topic		Duration
Driving Question		
Project Summary		

Standards & Skills Alignment		21 <sup>st</sup> Century Skills
	Primary Content Standards & Skills	
Science		
Technology		
Engineering		
Arts		
Mathematics		
Language Arts		
Social Studies		
Other		

☐ Critical Thinking  
☐ Collaboration  
☐ Complex Problem-Solving  
☐ Team Work  
☐ Conflict Resolution  
☐ Creativity  
☐ Innovation  
☐ Emotional Intelligence  
☐ Intrapersonal Skills  
☐ Reflection  
☐ Evaluation  
☐ Other:

Project Kick-Off

Presentation Audience

Assessments	
Formative	
Summative	
Individual	
Group	

# STEAM PBL LESSON

Class	Grade	Teacher
Topic	Duration	

## STEP 1: Desired Results

Established Goals / Content Standard Skills

Essential Question(s):

Students will understand, know, and be able to do at the end of the lesson ... (i.e. SWBAT)

## STEP 2: Assessment Evidence

Performance Task(s):

Other Evidence:

## STEP 3: Lesson Activities

Lesson Steps:

Materials:

Differentiation / Accommodations / Personalization:

*\*Lesson template is adopted from Tomlinson and McTighe, Integrating Differentiation Instruction + Understanding by Design, ASCD, 2006.*

# DAILY PROJECT LOG

Class / Group	Name	Teacher
<p>Driving Question:</p>		
<p>Questions and/or challenges from previous day that need answered:</p>		
<p>Feedback from teacher:</p>		
<p>Peer Feedback:</p>		
<p>Self-reflection:</p>		
<p>Something unexpected from today:</p>		
<p>Next Steps:</p>		

## DEFINE THE PROBLEM.

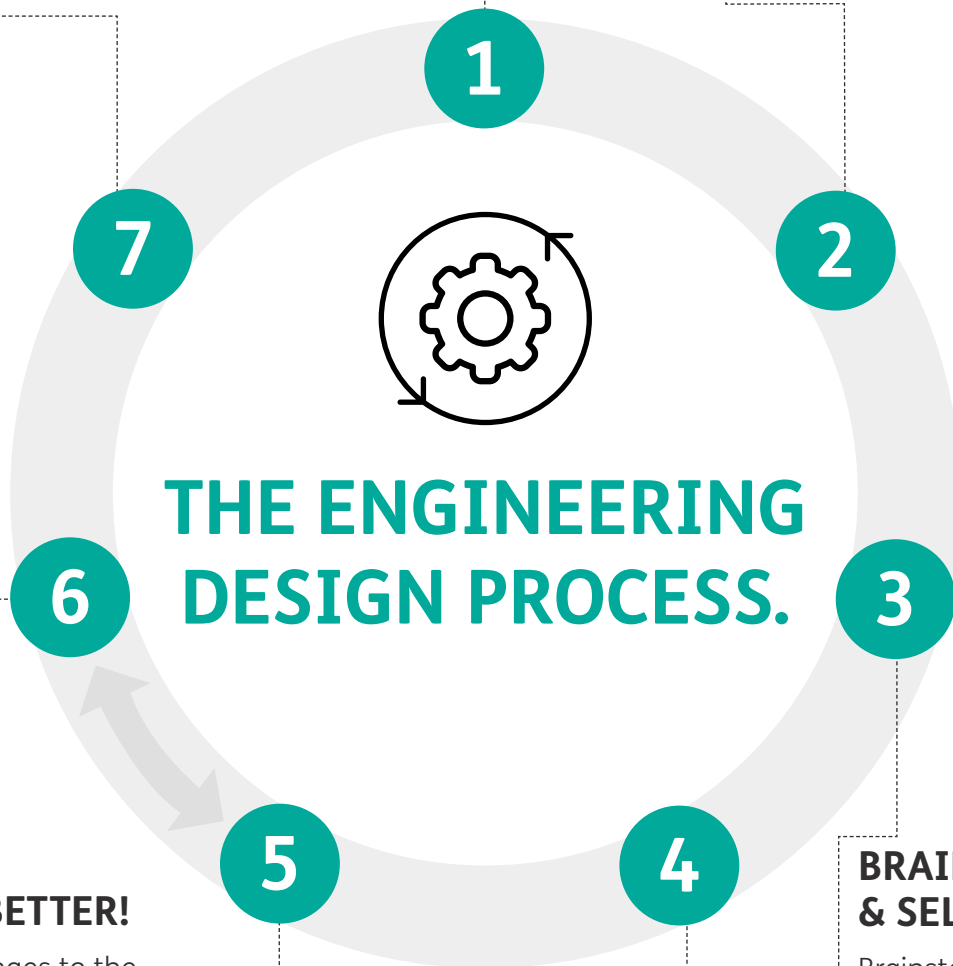
Ask, "What is the problem?"

## EXPLORE & IDENTIFY.

Ask, "What are constraints for creating a successful solution?" (i.e. space, materials, time, money, etc.) You may need to do research at this stage.

## COMMUNICATE.

Show and share out your results. Demonstrate how you came to the solution for the problem. Explain how your model solves for the problem.



# THE ENGINEERING DESIGN PROCESS.

## BRAINSTORM & SELECT.

Brainstorm and make a list of possible solutions. Select the best solution to explore.

## DEVELOP & PROTOTYPE.

Make a list of materials needed. Draw a sketch and diagram. List steps of the design process. Create a prototype (or build a model) of the possible solution.

## TEST & EVALUATE.

Test the prototype or model you created. Ask, "Does this solution solve the problem?" Analyze the results. Show how you came to this conclusion.

## MAKE IT BETTER!

Make the changes to the model or prototype to better solve for the problem. If you make changes, make sure to test and evaluate the model again.



# PROJECT DEVELOPMENT

Name

1

Define the problem.

2

Explore & Identify

*List constraints and limitations.*

3

Brainstorm & Select.

*Brainstorm and list out possible solutions. Select the solution to explore.*

4

**Develop & Prototype.**

5

**Test & Evaluate**  
*List findings.*

6

**Make it better!**  
*List ideas to modify  
your model.*

7

**Communicate.**  
*Describe how you  
will share.*



# ENGINEERING DESIGN PROCESS RUBRIC

Name			
	Developing	Proficient	Exemplary
Define the problem			
Explore & Identify			
Brainstorm & Select			
Develop & Prototype			
Test & Evaluate			
Communication			



pi-top is one of the fastest growing ed-tech companies and has a unique vision to increase access to coding and technical education through project-based learning. We want to inspire a generation of makers and give them the skills they need in a rapidly changing world.

If you want to learn more about project-based learning or pi-top, visit this [resource page](#) or contact **[sales@pi-top.com](mailto:sales@pi-top.com)**

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