

# STEAMing Up PBL: Problem-Based Learning for Student Engagement



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*Your Future. Our Focus.*



# NIUSTEAM



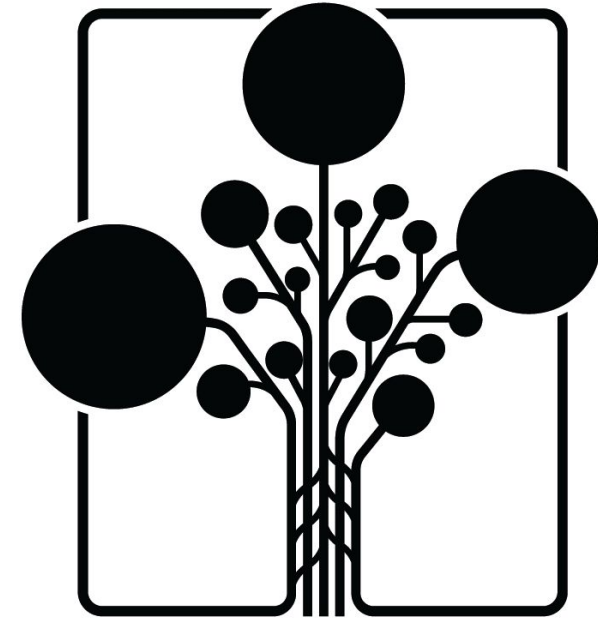
# NIU STEAM Approach

- Cultivate Curiosity and Creativity
- Foster Enthusiasm for Learning
- Persevere and Learn through Failure
- Explore Meaningful Connections
- Relate Curriculum to Students' Lives



# Catalysts for Effective STEAM Education

1. Problem (Project)-Based Learning
2. STEAM Concepts and Content
3. Essential Employability Skills
4. Growth and Persistence
5. Career Connections
6. Trans-disciplinary Approaches

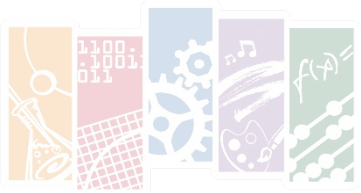


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# Today you will

- Discuss PBL examples.
- Explore the NIU STEAM Design Cycle.
- Discuss PBL design and implementation strategies.



# What is PBL

- Take 2 minutes to brainstorm key elements of PBL.
  - How would you define it?
  - What are some key characteristics?
  - What does it look like in the classroom?
  - What is the student's role?
  - What is the teacher's role?

Write down your answers – we will come back to these.



# Congratulations!

Sunnybright Elementary, has been awarded a \$10,000 grant to set up a school store to promote financial literacy and create a positive school culture. The Principal has asked for your input on the finished project and is looking for proposals. He has identified the 10'x8' room he will use for the store but would like proposals for the store including the furniture layout, store inventory, the “money system”, a communication plan, and suggestions on how to get students involved in the project.

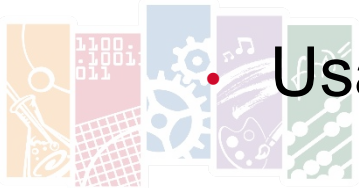


# Driving Question

How can we best use the available funds to design a school store for our students that will promote financial literacy and positively impact school culture?

Your proposal must include the following information:

- Project Budget
- Store description
- Room layout
- Inventory list
- Furniture list with costs- include any furniture you would build
- Usage plan – How would the store meet the goals?





# Think About Your Approach

- How would you approach this task?
- What ideas or concepts might you explore through this problem?
- How would you pitch your idea?



# What is PBL?



# NIU STEAM PBL

## Catalyst 1: Problem (Project)-Based Learning

- Effective STEAM education focuses on increased learning through engagement with a meaningful, real-world problem that includes collaborative evaluation and sharing of outcomes beyond the walls of the classroom (Buck Institute for Education, 2017, Savery & Duffy, 1996).

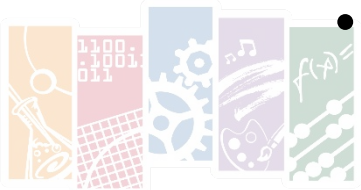


# Gold Standard of Project-Based Learning

## Learning Goals: Key Knowledge, Understanding, and Success Skills

### 7 Design Elements

- Challenging Problem or Question
- Sustained Inquiry
- Authenticity
- Student Voice and Choice
- Reflection
- Critique and Revision
- Public Product



PBL Works: <https://www.pblworks.org/what-is-pbl/gold-standard-project-design>

# How do I know if I'm Doing PBL or is it just a Project?



# IS IT A **PROJECT** OR IS IT **PROJECT-BASED LEARNING**?

PROJECTS	VS	PROJECT-BASED LEARNING
Can be done alone		Requires collaboration & teacher guidance
About the product		About the process
Teacher-directed		Student-directed
Lack real-world context		Based on real world experiences/problems
Occur after the "real" learning		Real learning occurs through the project
All projects have the same goal		Student choices to determine the outcome

<https://studentsatthecenterhub.org/resource/projects-vs-project-based-learning-what-is-the-difference/>

# project



# PBL



**LAUNCH**  
Hook students on the project through a provocative question or relevant task.

**CELEBRATE**  
Provide students the opportunity to celebrate their work with their peers and audience.

#HackingPBL

@rosscoops31

@murphysmusings5

hackingpbl.com

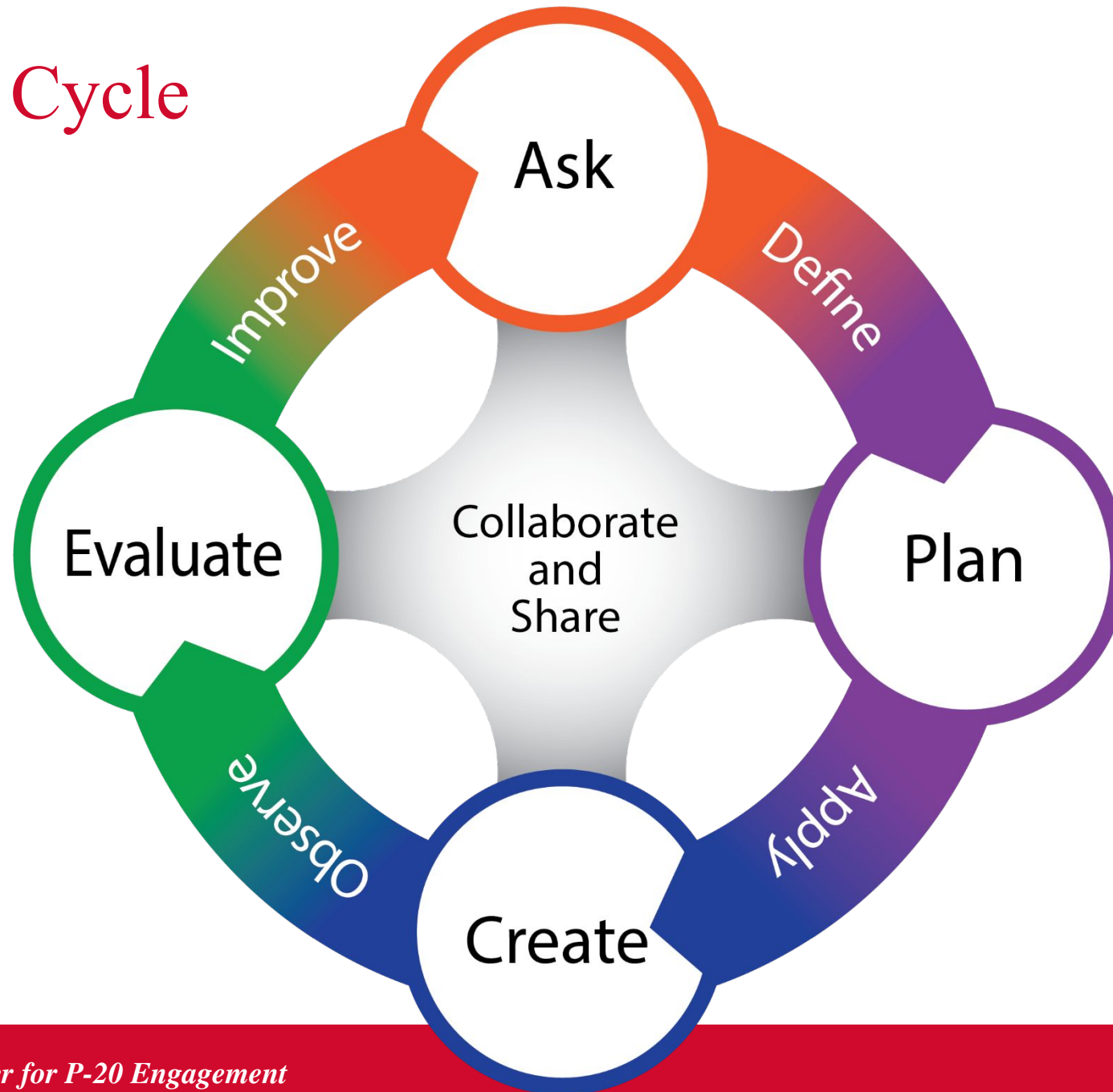


# How to Wrangle the Learning Chaos

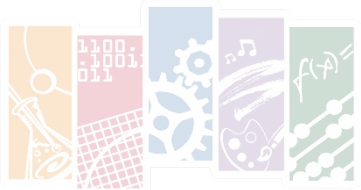




# Design Cycle

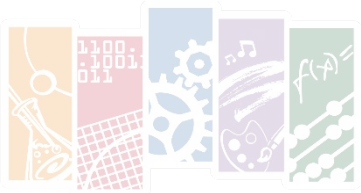


Promotes  
Collaborative  
Inquiry



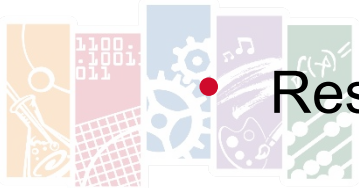
# PBL Design

- Identify core content
- Define key takeaways
- Create assessment plan
- Develop a driving question



# Target Content

- What is the focus?
- Identify the “High Impact Content” - *“content that is essential for students to learn and offers opportunities for exploration and creativity.”*
- Examples
  - Collaboration
  - Writing/Speaking goals
  - Planning/Organization
  - Research skills



# High Impact Takeaways

- Convert your content to takeaways.
- What are your learning outcomes based on your key content?
- “High Impact Takeaway” - *“Specific, designated outcomes. What students should know and be able to do...”*
- Every High Impact Content must be present in your High Impact Takeaways.



# Assessments

- What artifacts/products can be collected or observed as evidence of learning?
- Formative and Summative
- Examples
  - Group contracts
  - Self/peer-evaluation forms
  - Learning reflections
  - Writing samples
  - Rubrics



# Develop the Scenario: Creating a Driving Question



# Challenging Problem or Question

- Complex, ill-structured, and open-ended
- Realistic to students' experiences
- Promote conjecture and argumentation
- Afford feedback

Teacher defined vs. Student defined



# Simple vs. Complex Problems

## Simple problem

- Challenges
- Open ended
- Examples
  - Design an irrigation system
  - Design a solution to our problem of unsharpened pencils
  - Design a landing system for a new Mars Rover

## Complex problems

- Messy
- Multiple content areas
- Examples
  - Population- quality of life?
  - Promoting health and safety
  - Advancing technology
  - Improve school lunch program





# Sunnybright and PBL

- What PBL characteristics did you see in the store problem?
  - How was it Student-centered?
  - What was the instructor role?
  - How was this an authentic problem?
  - Was the problem used as the tool for learning?
  - Did it include self-directed learning? If yes, how?

**What was missing?**



# The Elements of a good DQ

- Engaging and interesting to students
- Open ended
- Connects with your learning goals (HICs an HITs)
- Two types (according to PBL Works)
  - Debate or philosophical question
  - Design a product or solve a problem



<https://www.pblworks.org/blog/tricky-part-pbl-writing-driving-question>



# Authentic PBL Scenarios

- UN Sustainable Development Goals - <https://sdgs.un.org/goals>
  - By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse
  - By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round

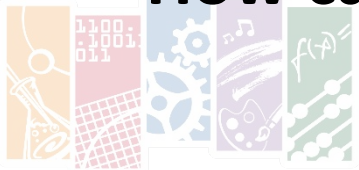


# Example

## Scenario

The City has been given an old strip mall and is looking to turn it into a community/teen center. They are asking local teams to develop proposal for how to best use the space. Each design team will have an opportunity to present their design proposals to the city and key stakeholders. All proposals must include a review of their needs analysis, a design narrative that describe how the space will be used and key features, a model of the space, and a project budget. Each design should also take into consideration current green building initiatives and energy efficiency.

**How can we design an energy efficient community/teen center to best meet the needs of the community?**



# Learning Objectives

Upon completion of this project participants will be able to...

- Create a project plan with clear deliverables and project timeline.
- Use data and research to justify design decisions.
- Work collaboratively with others to complete a project on time.
- Create a model or visualization of their proposed design using appropriate tools.
- Describe the benefits and challenges of their proposed design.
- Design and deliver a presentation about their design with all required elements.



# Example

## Scenario

### Welcome to Level-Up Your Life Skills: A Failure Bites Career Exploration Camp

Over the next two weeks we'll refine our life skills and take on the challenge of seeing a project through from conceptualization to delivery. You'll build essential employability skills and get to learn all about how resiliency and failure are key to success. The big questions to keep mind over the next two weeks are: What does success look like to me? What does failure mean to me? How can I achieve the goals I want to achieve? Why do some recover from failure more effectively than others?

**How can we communicate the importance of failure's role in success using personal stories?**



# Build a DQ

- Frame with words such as: *How can, why should, could..*
- Identify the entity: *We, a school, city, a government*
- Identify the action: *create, design, build*
- Identify the audience or the where

PBL Works - Tubric 2.0

[https://my.pblworks.org/resource/document/driving\\_question\\_tubric](https://my.pblworks.org/resource/document/driving_question_tubric)



# Other Types of Driving Questions

- Creating a product
- Educating others
- Convincing others
- Forming an opinion
- Philosophical issues





How could you use this in your classroom?



# General Design Guidelines

- Think of a PBL as phases - use the design cycle as a guide
- Needs structure but also needs to be flexible
- Larger scope than a lesson
- Lasts longer than one session
- Several learning goals
- Composed of multiple lessons, tasks, activities, assignments, formative assessments
- Helps to design collaboratively
- Plan broad – fill in details later



# Questions?



# Contact Us



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