

*RC-PM-143-4: Enhancing Primary Mathematics Learning  
in the STEM Environment*

# Project-Based Learning

Training Program Division, SEAMEO RECSAM

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# Focus Questions:

- What is Project-based learning?
- Why is project-based learning important?
- How to implement a project-based learning in mathematics?

# What is Project-Based Learning (PBL)

- PBL is a student-centered and dynamic classroom approach in which students **learn by doing project**.
- Projects are **real-world** complex tasks, that involve students in **investigative activities** that require them to design, solve problem, and make decision.
- PBL gives students the opportunity to work relatively **autonomously** over an **extended period of time**.
- PBL result in **realistic products** or presentation.

Thomas, J. W. (2000). A review of research on project-based learning. Available online at:  
[http://www.bobpearlman.org/BestPractices/PBL\\_Research.pdf](http://www.bobpearlman.org/BestPractices/PBL_Research.pdf)



1. Design a bird aviary for RECSAM.
2. Design a swimming pool for RECSAM.
3. Design a standard room for RECSAM International House.
4. Design a gym & fitness center for RECSAM.



## Site Visit

Go to visit the site to collect  
some data for you design.

Time: 40 minutes

## Planning

- A scale drawing of plan & elevation (label with real measurement)
- Cost estimate

## Executing Your Plan

A scale model

## Presentation

Explain your model

# DEBRIEFING

Reflecting on what we have gone through.

# Debriefing: What is PBL?

- PBL is a student-centered and dynamic classroom approach in which students **learn by doing project**. Projects are **real-world** complex tasks, that involve students in **investigative activities** that require them to design, solve problem, and make decision. PBL gives students the opportunity to work relatively **autonomously** over an **extended period of time**. PBL result in **realistic products** or presentation.

Thomas, J. W. (2000).

- PBL is an instructional model based on having students confront **real-world** issues and problems that **they find meaningful**, **determine how** to address them, and then act in a **collaborative** fashion to **create** problem solutions.

Bender, W. N. (2012). *Project-based learning. Differentiating instruction for the 21<sup>st</sup> century*. Thousand Oaks, CA: Corwin.



# Debriefing: Is this project a PBL?

## Project

Every student will construct a collection of the following 3-D shapes:

- (a) triangular-based prism, square-based prism, pentagonal-based prism, and hexagonal-based prism.
- (b) triangular-based pyramid, square-based pyramid, pentagonal-based pyramid, and hexagonal-based pyramid.

Study these 3D shapes, then prepare a Power-point presentation on prism and pyramid. Content of your Power-point presentation should answer the following questions: (a) What is a prism? (b) What is a pyramid? (c) What are the similarities and differences between a prism and a pyramid?

**No, this project is not PBL!**

Why?

# Debriefing: Are all projects PBL?

PBL focuses on project, but NOT ALL classroom projects are PBL.

## ❑ Essential elements of PBL:

- Authentic real-world problem
- Collaborative team work

(Bender, 2012)

## ❑ Some other characteristics of PBL:

- Driving questions
- Feedbacks, reflection & revision
- Students' voice & choice

# Debriefing: An example of PBL in Maths

## Project

Study and analyze the use of 3-D shapes in the construction of houses in your community. Your team may consider taking photographs of the houses to help in the analysis.

Make a comparison between houses in your community and other communities.

Prepare a team Power-point presentation. Content of your presentation should cover the answers to the following questions:

- (a) How 3-D shapes are used in the construction of houses?
- (b) What 3-D shapes are used more often? Why?

# Designing a PBL Task

Discuss with your team members.

Suggest one project for PBL in mathematics.



# Debriefing: Why PBL?

Some findings from research:

- Students' **motivation** increases
- Students' **achievement** increases
- Promote higher level of **conceptual understanding**, deeper **reflection**, & increased **critical thinking**
- Enhanced **retention** of information
- Foster **problem-solving skills** required for the 21<sup>st</sup> century

(Bender, 2012)

# How to implement PBL in mathematics?

- ❑ Fitting PBL into topic-based curriculum
  - As an added component of one or more topics
- ❑ Designing PBL Task
  - Driving questions
  - Expected products
  - Project timeline
  - Assessment of products

# Steps in a PBL Instructional Project

- Introduction & team planning
- Gathering information
- Developing initial team product
- Revise & improve
- Final presentation of team product
- Assessment of team product
- Sharing of team product

(Bender, 2012)

# Assessment of PBL Project

## Use of rubric

- Important for assessing PBL because products are often open-ended
- Both analytic and holistic are suitable

## Grading

- Combination of team grade and individual grade is recommended



# Instructional Technology in PBL classrooms

## 21<sup>st</sup> –Century Digital World

- It goes beyond using software programs for repetitive practices
- Use of a Webquest
- Use of mobile technology
- Use of digital video cameras

Turn to your partner

- And –

Ask a question  
about project-based learning  
in mathematics.

# Reflections:

- Two things that you like about today lesson.
- One question that you still have about today lesson.