

Project Based Learning (PBL) 101

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What is Project-Based Learning (PBL)?

Project-Based Learning (PBL) is an instructional approach where students learn through active participation in real-world and personally meaningful projects. Students acquire knowledge and skills through an (extended) period of engagement, investigating and responding to an authentic, engaging, and complex question, problem, or challenge.

Why incorporate PBL?

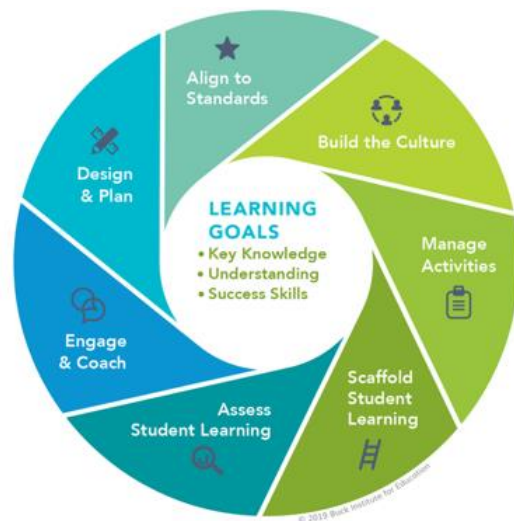
PBL

- Serves as a high-impact practice in improving retention rates (Kuh, 2008).
- Contributes to a sense of belonging (Rohde et al., 2019), fostering a supportive learning environment.
- Plays a crucial role in enhancing self-efficacy and student identities (Robnett et al., 2015; Rohde et al., 2019).
- Closes equity gaps, particularly among URM students (Wilson et al., 2009).

7 Essential Project Design Elements

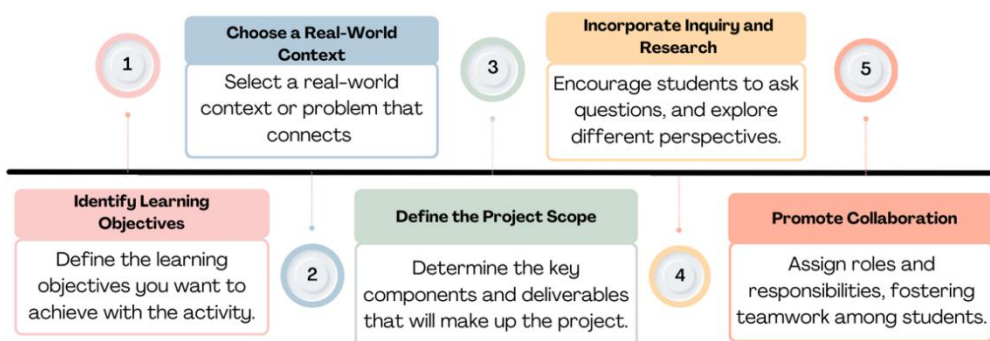


7 Project Based Teaching Practices



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

5 Tips for Modifying an Activity to a Project



Example of a PBL Project from a Mathematics Course (Calculus 1, MATH 30)

Learning Outcomes: Students will

- identify quantities that are changing over time.
- pose real-world questions, make assumptions, and analyze real data to answer rate of change.
- demonstrate the ability to lead and productively participate in group settings.
- apply quantitative knowledge to solve problems and make decisions.



Part I: Instructor provides photo cards to students. Students collaboratively identify the quantities that change continuously and complete the sentence:

If I knew (this quantity) ..., then I could (say something about) ...

Part II: Students bring their own photo scenarios from their community and complete the I Knew – I Could statement. They also explore specific data needed to explore their statements.

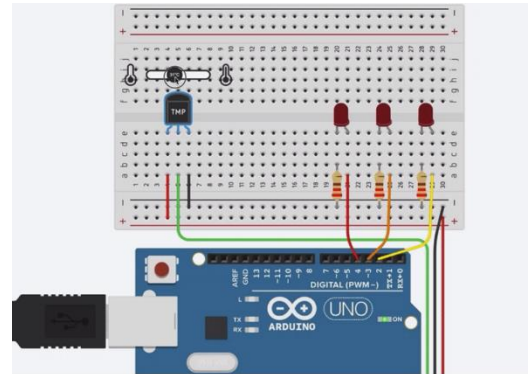
Part III: Use tools from the course content to analyze rate of change of the quantities involved in the photo scenarios and write a report.

Example of a PBL Project from an Engineering Course (Introduction to Engineering, ENGR 1)

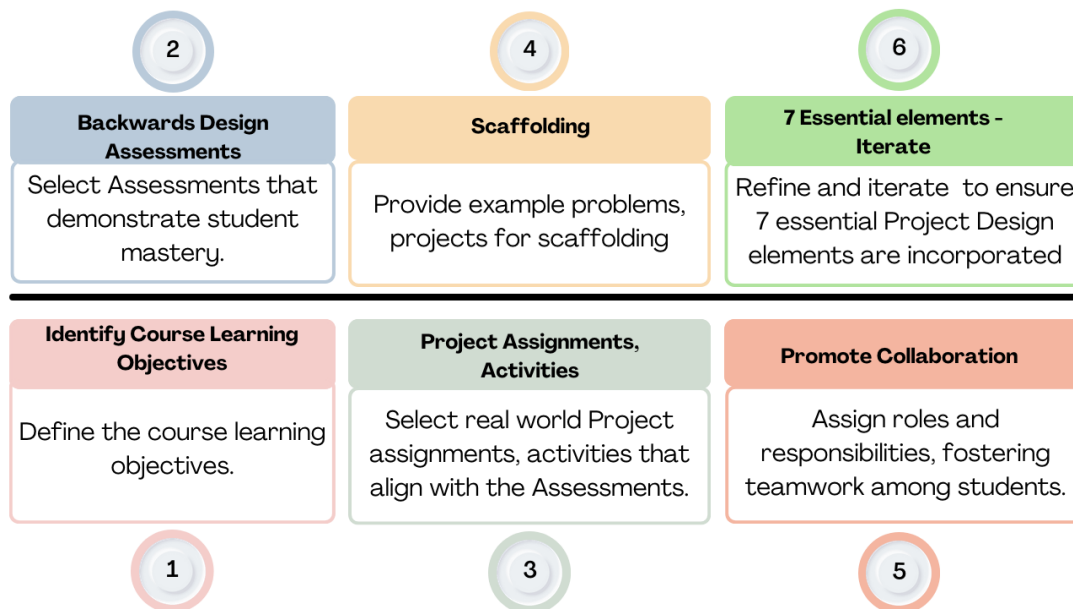
See attached example project – [A weather station with data logging](#).

In this project in their first Engineering course, students work on a project that measures real world parameters.

Objective: Using a temperature sensor and microcontroller, measure temperature periodically and log the data to a storage element.



Tips for Redesigning a PBL Course



References (Project Based Learning (PBL) 101)

- Kuh, George D. 2008.** 'Excerpt from high-impact educational practices: What they are, who has access to them, and why they matter', Association of American Colleges and Universities, 14: 28-29.
- Robnett, Rachael D.,** Martin M. Chemers, and Eileen L. Zurbriggen. 2015. 'Longitudinal associations among undergraduates' research experience, self-efficacy, and identity', *Journal of Research in Science Teaching*, 52: 847-67.
- Rohde, Jacqueline,** Lisa Musselman, Brianna Benedict, Dina Verdin, Allison Godwin, Adam Kirn, Lisa Benson, and Geoff Potvin. 2019. 'Design Experiences, Engineering Identity, and Belongingness in Early Career Electrical and Computer Engineering Students', *IEEE Transactions on Education*, 62: 165-72.
- Wilson, Christopher D.,** Joseph A. Taylor, Susan M. Kowalski, and Janet Carlson. 2009. 'The relative effects and equity of inquiry-based and commonplace science teaching on students' knowledge, reasoning, and argumentation', *Journal of Research in Science Teaching*: n/a-n/a.