

Evidence Brief

Project-Based Learning: Six Promising Practices for Real-World Problem Solving with Students

How Did We Compile This Evidence?

We searched YouthREX’s online Knowledge Hub, Google Scholar, and Google using the following key terms: “real-world problem solving,” “real-world problems,” “problem-based learning,” and “project-based learning.”

Definitions of Key Terms

Project-based and problem-based learning approaches use real-world problems and differ from traditional instruction in other ways: they value student autonomy, involve extensive group work, and are longer and more multi-faceted than traditional lessons or assignments (Larmer, 2014).

Project-Based Learning (PBL) is an instructional approach that “empowers learners to collaborate in teams, mentored by their teachers, as they research real-world questions, pose solutions to real-world problems, and design real-world products in a rigorous way” (Hutchison, 2015, p. 2). PBL often requires students to conduct research, meet with experts, and build prototypes in order to produce and/or present a final product/solution that answers the driving question.

Problem-Based Learning is closely related to Project-Based Learning, and these concepts are often confused or used interchangeably (Larmer, 2014). However, practitioners suggest that this term usually describes a shorter, single-subject method in which questions are based in real-world situations but may not be fully authentic (Larmer, 2014).

This Evidence Brief focuses on Project-Based Learning because it most closely aligns with the concept of ‘real-world problem solving’.

Part One: Summary of Evidence – Outcomes of Project-Based Learning (PBL)

PBL has been linked to a variety of **measurable outcomes** in areas of knowledge acquisition and skill building. Evidence suggests (Buck Institute for Education, 2013) that this approach is associated with improvements in:

- Academic achievement (see also Chen & Yang, 2019)
- Problem-solving skills
- Critical thinking skills (see also Holmes & Hwang, 2016)
- Collaboration and conflict resolution

- Equity (see also Holmes & Hwang, 2016)
- Motivation (see also Holmes & Hwang, 2016; Remijan, 2017)
- Empowerment and a sense of ownership (see also Remijan, 2017)

Studies also show that authentic projects can promote **a sense of civic purpose and engagement**, especially when they result in genuine products/solutions for a real-world audience (Baines et al., 2015; Remijan, 2017).

Part Two: Summary of Evidence – Six Promising Practices

1. Foster student autonomy.

PBL involves moving away from traditional power dynamics in which the teacher is the expert to a classroom culture that encourages active contributions from students (Baines et al., 2015). Evidence suggests that having choice and autonomy can help students develop **a sense of ownership** and control over their learning (Kokotsaki et al., 2016). Teachers should offer constructive feedback but allow students to pursue solutions without teaching or ‘telling’ them if those solutions will work. This can also contribute to the development of **problem-solving skills** (Washoe County School District, n.d.).

2. Promote inclusive group work.

Effective collaboration is critical to supporting positive student outcomes in PBL. Some research shows that inclusive group work may **increase motivation and reduce the achievement gap** between racialized students and their peers (Holmes & Hwang, 2016). Educators should provide students with the tools they need to effectively work in groups and draw on group members’ strengths in a collaborative way (Hutchison, 2015). Consider randomly assigning students to small groups in order to promote dialogue among diverse group members.

3. Integrate multiple opportunities for assessment.

Educators can **build ownership** for project outcomes among students by jointly agreeing on grading criteria before the start of the project (Hanover Research, 2015; Kokotsaki et al., 2016). Promote student success by integrating multiple opportunities for teams to receive feedback and revise their work. Assessment should be multi-faceted and ongoing, in the form of progress checks, feedback, and formal evaluation (Remijan, 2017). The final products should reflect real-world professional practice, encourage participation, and signal social value (e.g., exhibitions, portfolios, performances, and reports). Students can also benefit from an opportunity to showcase their work to a genuine audience outside of the classroom or school (Future Design School, 2018).

4. Prioritize effective project management.

PBL is more open-ended than traditional instruction, which means that students and teachers must

deal with a high degree of ambiguity. In order to **empower** students to take ownership of their learning, teachers must provide “intentional, structured guidance and clear routines” (Baines et al., 2015, p. 23). Teachers should continually monitor student progress, address problems as they arise, and motivate students to effectively communicate and collaborate (Hutchison, 2015; Remijan, 2017). Consider requiring teams to pitch a proposal, submit a project plan, and make changes based on teacher and peer feedback (Hutchison, 2015).

5. Integrate technological resources.

The use of technology in PBL has been found to contribute to **improved academic achievement** (Chen & Yang, 2019). Educators should encourage students to explore relevant websites and to critically assess online sources.

6. Offer extensive teacher support.

Professional development is essential for successful outcomes with PBL (Hanover Research, 2015), and must include long-term supports that address ‘just-in-time’ teacher needs (Baines et al., 2015). A supportive **community of practice** can make PBL a “living, sustainable practice” (Baines et al., 2015, p. 24). Organizations should make space for teachers to connect with their peers, reflect on their experiences, and share resources and strategies.

References

- Baines, A., DeBarger, A. H., De Vivo, K., Warner, N., Brinkman, J., & Santos, S. (2015). *What is rigorous project-based learning? (LER Position Paper 1)*. Retrieved from <https://www.lucasedresearch.org/files/WhatIsRigorousProjectBasedLearning.pdf>
- Buck Institute for Education. (2013). *Research summary: PBL and 21st century competencies*. Retrieved from http://pblworks.org/sites/default/files/2019-01/FreeBIE_Research_Summary.pdf
- Chen, C., & Yang, Y. (2019). Revisiting the effects of project-based learning on students' academic achievement: A meta-analysis investigating moderators. *Educational Research Review, 26*, 71-81.
- Future Design School (2018, November 11). Best practices for introducing project-based learning. Retrieved from <https://medium.com/@futuredesignschool/best-practices-for-introducing-pbl-9a90f5c6407d>
- Hanover Research. (2015). *Project-based learning and best practices for delivering high school STEM education*. Retrieved from <https://www.gssaweb.org/wp-content/uploads/2015/04/Project-Based-Learning-and-Best-Practices-for-Delivering-High-School-STEM-Education-1.pdf>
- Holmes, V., & Hwang, Y. (2016). Exploring the effects of project-based learning in secondary mathematics education. *The Journal of Educational Research, 109*(5), 449-463.
- Hutchison, D. (2015). Project-based learning: Drawing on best practices in project management. *What Works? Research Into Practice, September 2015*. Retrieved from http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/WW_BestPractices.pdf
- Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. *Improving Schools, 19*(3), 267-277.
- Larmer, J. (2014, January 6). Project-based learning vs. problem-based learning vs. X-BL. Retrieved from <https://www.edutopia.org/blog/pbl-vs-pbl-vs-xbl-john-larmer>
- Remijan, K. W. (2017). Project-based learning and design-focused projects to motivate mathematics students. *Interdisciplinary Journal of Problem-Based Learning, 11*(1). Retrieved from <https://docs.lib.purdue.edu/ijpbl/vol11/iss1/1/>

Washoe County School District. (n.d.). *21st century competencies: A guide to planning instruction for 21st century learners. Real-world problem solving and innovation*. Retrieved from <https://www.washoeschools.net/cms/lib/NV01912265/Centricity/domain/170/21st%20century%20elevator%20guides/RWPS%20Planning%20Instruction%20for%2021st%20Century%20Learners%20v2%20-%204%20Real-World%20Problem%20Solving.pdf>