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The Evidence is Clear: Rigorous Project-Based Learning is an Effective Lever for Student Success

Introduction

Four newly released peer-reviewed research studies show that using rigorous project-based learning in U.S. public schools has strong and positive effects on student outcomes across grades and subjects. Project-based learning (PBL) is an inquiry-based approach in which students explore real-world problems through individual and group projects. With PBL, students make sense of why content is useful and how it might be applied. Academics from universities around the country in partnership with K-12 teachers conducted the studies with funding from Lucas Education Research, a division of the George Lucas Educational Foundation.

Key findings include:

- Adding rigorous PBL to Advanced Placement courses improved student achievement on AP exams.
- Elementary science students improved in science and areas of social and emotional learning with a project-based approach.
- Early elementary students using project-based learning made more progress in social studies and informational reading than peers in more traditional classrooms.

- Middle-school students outperformed their peers in science and other core subjects and improved in groupwork when using a project-based learning approach to science instruction. English language learners in the PBL classrooms also did better than a comparison group on a language proficiency test.

These studies show the positive impact of project-based learning across content areas, grade levels, and for students from all types of backgrounds. The researchers found PBL improved student achievement in targeted content areas as well as in other subject areas and aspects of social and emotional learning. Taken together, these findings add strong evidence to the idea that students thrive when hands-on, inquiry-based learning is part of their educational experience and that rigorous PBL can be a lever for improving teaching and learning in U.S. schools. What follows is a description of the research studies and a brief discussion about the likely implications of the findings on the field.



Knowledge in Action: A project-based approach to Advanced Placement courses

University of Southern California researchers examined the impact of PBL and aligned resources and teacher professional-learning experiences on student outcomes in Advanced Placement (AP) courses. The study is the first to harness the power of a randomized control trial to investigate the impact of PBL on AP exam scores. The study found that students who took the project-based AP courses were more likely to receive a credit-qualifying score on the AP tests, meaning they earned a score of 3 or higher on a scale of 1-5.

The PBL program, Knowledge in Action (KIA), increased the probability of earning an exam score of 3 or higher on AP US Government or AP Environmental Science by about 8 percentage points in the first year of implementation. Results from a follow-up study suggest that students continued to benefit from KIA as teachers gained experience. Students of teachers in the second year of using a KIA curriculum had a 10-percentage point boost in the likelihood of earning an AP Exam score of 3 or higher.

University of Washington academics and high school teachers developed the KIA approach. It is an open educational resource that embeds rigorous, authentic projects within AP courses in five units taught over the course of a year. Teachers receive strong and sustained professional-learning opportunities.

The findings of the study have important implications for practitioners and policymakers. School and system leaders and educators have reported that a barrier to adopting PBL can be the perception that the approach doesn't prepare students for end-of-year or other high-stakes tests, including AP exams. This research challenges that view. The deep knowledge and skill-building found in KIA classrooms and aligned teacher supports promote student achievement as measured by AP tests.

The researchers conducted the study in five predominantly urban districts. A significantly higher proportion of the students in the study were from low-income households than is typical for AP test-takers. Furthermore, the study found that the KIA program improved the performance of students from both lower and higher socio-economic

families, reinforcing the view of many education and civil-rights advocates that underrepresented students should get more equitable access to rigorous, college-preparatory coursework.

Multiple Literacies in Project-Based Learning: Third- grade science program boosts achievement and improves social and emotional learning

Researchers from the University of Michigan, Michigan State University, and the University of Wisconsin investigated the impact of a project-based approach to science instruction in third-grade classrooms. They found PBL, plus aligned resources and professional learning for teachers, led to higher achievement levels on a science assessment aligned Next Generation Science Standards (NGSS).

The randomized controlled trial found students in the classes using the Multiple Literacies in Project-based Learning (ML-PBL) approach performed 8 percentage points better on the science assessment as compared with students in the control group classrooms. In addition, a student survey showed the ML-PBL students grew more in areas of reflection and collaboration, hallmarks of social and emotional learning in science classrooms.

ML-PBL is an open educational resource and interdisciplinary approach to teaching that integrates science, reading, mathematics, and aspects of social and emotional learning. The developers designed ML-PBL to enhance students' curiosity about the natural world, pique their interest in problems that have relevance to their lives, and support them as they solve real-world problems.

While the study was conducted in schools in Michigan, an analysis of the demographic composition of the study schools confirmed that findings can be generalized beyond Michigan. The students in the sample were representative of third graders throughout the country. The significant effects persisted across schools with differing racial and ethnic makeups and household-income levels and in various regions of the state, providing strong evidence that this approach is beneficial for all students.



Project Place: PBL curriculum increases social studies and literacy achievement in elementary school

The randomized controlled study explored the effects of a PBL social studies curriculum on social studies and literacy achievement among second-grade students in low-income, low-performing schools. The results showed a statistically significant and positive effect of the PBL curriculum. Students who used it showed five to six more months of growth in social studies and about two more months of growth in literacy achievement—specifically, informational reading—as compared to peers.

The Project PLACE curriculum is an open educational resource centered around four projects over the course of a school year that address a problem or take advantage of an opportunity in the students' communities and beyond. The approach calls for a combination of teacher-led and student-led activities all driven by an authentic purpose.

This study, conducted by University of Michigan and Michigan State researchers, contributes to the research landscape in several important ways. Researchers conducted the study in high-poverty, low-performing schools, and the majority of participating students were from underrepresented racial and ethnic groups. Poor students and underserved minorities are generally more likely to receive instruction that is focused on basic reading and math skills and less likely to emphasize the critical thinking and discussion skills found in rigorous PBL instruction. This study supports the view that should change. The study also helps fill a previous need to explore the impact of PBL on student achievement in early elementary grades.

Learning Through Performance: Middle school science program leads to subject-matter gains and higher language proficiency levels in English language learners

Stanford University researchers, working with middle school teachers, designed the Learning Through Performance (LTP) in Middle School Mathematics and Science project. The research team developed, piloted, and researched the efficacy of a sixth-grade project-based learning science course aligned to the Next Generation Science Standards (NGSS) and related professional-learning opportunities for teachers.

They found students in LTP classrooms, in the second year of the program, outperformed a comparison group by 11 percentage points on a science assessment developed as a measure of students' proficiencies with NGSS practices.

LTP students also outperformed comparison students on state standardized tests in mathematics and English language arts. In addition, LTP students classified as English language learners outperformed matched students on an assessment used by California to measure language proficiency skills. The design team worked to ensure the content was accessible for all students, including English language learners, which likely contributed to gains for that subgroup. Design features of the curriculum included language-specific objectives, balancing writing and discussion, and other targeted strategies to foster language development.

The study found LTP also improved student engagement and improved teacher practices. Specifically, teachers improved at facilitating group work, using activities that involved real-world applications of science, leveraging language-rich assignments, and administering performance assessments.

Researchers conducted the study in high-poverty, racially diverse schools, providing important evidence that when underserved students, including English language learners, engage in authentic, real-world science instruction, significant learning across multiple content areas occurs.



Conclusion

Taken together these four studies show that rigorous project-based learning is an important lever for improving student outcomes and teaching practices in K-12 schools, across subjects and grades. The findings show that embedding PBL in courses can yield significant and positive effects on measures of student achievement, including AP exams, NGSS-aligned science assessments, state math and English language arts tests, and social studies and reading assessments.

Moreover, researchers conducted the studies in diverse districts with large percentages of traditionally underserved students, indicating project-based learning can be a powerful lever for improving equity in U.S. schools.

It is important to note that each of the curricula at the center of the studies included aligned professional learning for teachers and were closely tied to core subject-matter content. Projects were central to each curriculum, not an add-on or minor feature.

These resources are freely available on the online [Sprocket portal](#) on the Lucas Education Research website. However, more PBL resources are needed to bring project-based learning to scale. The strong, positive findings of this body of research should spur policymakers, educators, and curriculum designers to work together to bring hands-on, authentic learning experiences to more students across U.S. public schools. The evidence is clear all students will benefit.