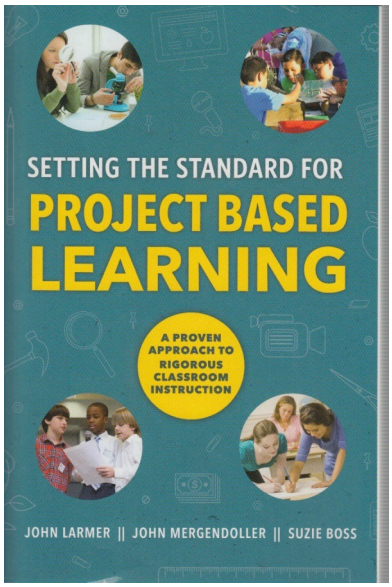
An Introduction to Project Based Learning

Setting the Standard for Project Based Learning:
A Proven Approach to Rigorous Classroom Instruction
John Larmer, John Mergendoller, and Suzie Boss



Book Excerpts

"Project based learning (PBL) is not a new instructional approach, but … current concerns with college and career readiness, and the performance-based emphases of the Common Core State Standards, have caused educators to take another look at project based learning and recognize its ability to not only help students develop deep content understanding, but also to help students learn and practice the skills they will need for college, career, and life success" (p. ix).

"PBL makes school more engaging for students… In PBL, students are active, not passive: a project engages their hearts and minds, and provides real-world relevance for their learning" (p. 156).

"PBL provides opportunities for students to use technology. Modern technology—which students use so much in their lives—is a perfect fit with PBL. With technology, teachers and students can connect with experts, partners, and audiences around the world, and find resources and information, create products, and collaborate more effectively" (p. 156).

"PBL helps address standards. The Common Core and other present-day standards emphasize real-world application of knowledge and skills, and the development of 21st century success skills such as critical thinking, communication in a variety of media, speaking and presentation skills, and collaboration and others. PBL is an effective way to meet these goals" (p. 156).

"PBL connects students and schools with communities and the real world. Projects provide students with empowering opportunities to make a difference in their communities and the wider world, b solving real problems and addressing real issues. Students learn how to interact with adults and organizations, are exposed to workplaces and adult jobs, and can develop potential career interests. Parents and community members can be involved in projects" (p. 157).

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Powerful Communities

Project Type: Solving a Real-World Problem
Driving Question: *How might we design a more peaceful community?*
Grade Level and Subject: Primary/early elementary; literacy, social studies

When minor conflicts between students started to migrate from the playground into the classroom, a team of 1st grade teachers turned a problem into an opportunity for inquiry.

Teachers Beth Lopez, Glenda Forgie, and Freny Dastur are the 1st grade team at the American School of Bombay in Mumbai, India. They designed the *Powerful Communities* project to engage students' problem-solving skills and also address grade-level learning goals for social studies that focus on the role of communities.

To scaffold the inquiry experience for young learners, teachers introduced students to the process of design thinking. The design-thinking process, used in a variety of industries as well as in education, typically starts with an empathy phase: understanding a problem by studying and engaging with those most affected by it. During this phase, students made observations about conflicts they noticed in and around campus—a community in microcosm. They analyzed the data they gathered to detect patterns and pinpoint where conflicts were most likely to occur, and then shared their findings by creating graphs. Through their analysis, students were able to group problems into types, such as small problems (that students should be able to resolve themselves) and big problems (that might need help from an adult).

Literacy skills also came into play. During read-alouds, students discussed conflicts in children's literature and noted how different literary characters responded to tensions. Students put their listening and speaking skills to good use, too. For example, they interviewed their school principal and other experts about the importance of a peaceful environment for learning.

When students were ready to generate possible solutions, they used a graphic organizer to capture their thinking. Three prompts asked students to describe (in words or pictures, or both)

questions like, 'If an animal can hop this far, how high would the fence or barrier need to be?'" Some students designed exhibits with an emphasis on accessibility for visitors with disabilities. One girl added a waterfall feature to her exhibit. "She designed it to be a water-purification feature to benefit animals, but also to be aesthetically pleasing to visitors. She realized that people are attracted to exhibits that look cool," Lee says.

During the revision process, teachers and outside experts gave students critical feedback to help them improve their plans. One student's aunt, for instance, happened to have experience working at the zoo and agreed to offer constructive feedback. Teachers challenged students to be true to animals' habitat needs but also go for the "wow!" factor that would attract human attention to their exhibits. That got students thinking about the use of color, artwork, and other elements. "They started thinking like architects and interior designers," Lee says. Students wrote informational texts about their habitat designs, explaining the scientific basis for their designs and demonstrating their in-depth understanding of ecosystems.

At the culminating event, the zoo's education director came to listen to students' presentations. He asked detailed follow-up questions about the thinking behind their design decisions. Parents had a chance to watch, even if they couldn't attend in person. Teachers livestreamed the presentations via Adobe Connect. Some teams also presented their work to the school's Parent Teacher Organization. "Parents said they didn't realize how creative their own kids are," Lee says. "They could see this was out-of-the-box thinking."

(You can read a case study about Novi Community School District's approach to building teacher leadership for PBL on page 150.)

How to extend this project:

With older students, expand career exploration opportunities by having students interview technical experts (such as architects or zoologists) about their professions. Expand math content by having students produce detailed budgets about their proposals. Integrate geography by having students analyze habitat loss in the regions where endangered zoo species are native.

Home Sweet Home

Project Type: Design Challenge
Driving Question: *How can we design a habitat for the Detroit Zoo?*
Grade Level and Subject: Upper elementary (grade 4); ELA, science

When the Detroit Zoo announced plans to build a $21 million conservation center dedicated to penguins—complete with an indoor viewing area where visitors will be able to watch the aquatic birds explore underwater—teachers at Village Oaks Elementary and Deerfield Elementary in Novi, Michigan, saw an opportunity for their 4th graders to dive into their own investigation of habitats.

They designed the *Home Sweet Home* project to address specific learning goals for reading and writing, along with science. Teachers saw opportunities for technology integration, as well, by having students use iPads to research and document their investigations with photos and video.

To add authenticity to the project, teachers contacted an education expert at the Detroit Zoo. Adam Dewey wrote a detailed letter to students that became the entry document for their project. In it, he invited students to collaborate with the zoo on designing models for animal habitats. He emphasized specific design criteria, such as considerations for animal welfare, positive guest experiences, and zookeeper safety. Student teams had the opportunity to choose a species that interested them, and then design a model habitat that would meet all criteria.

Myla Lee, PBL coordinator for the Novi Community School District, was impressed by students' depth of inquiry and critical thinking in the project. "They took this to another level. They were not only thinking about predator/prey relationships, life cycles, and survival, but also about the architecture of zoo exhibits," she says. Students learned about the behind-the-scenes features of zoos that separate predators from prey and help zookeepers stay safe. "There are trenches and barriers that animals can't get over, but you can't see those as a zoo visitor."

As students developed their habitat plans, Lee could see their critical thinking and creativity getting a workout. "They started asking

questions like, 'If an animal can hop this far, how high would the fence or barrier need to be?'" Some students designed exhibits with an emphasis on accessibility for visitors with disabilities. One girl added a waterfall feature to her exhibit. "She designed it to be a water-purification feature to benefit animals, but also to be aesthetically pleasing to visitors. She realized that people are attracted to exhibits that look cool," Lee says.

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Figure 4.1 Projects Versus Project Based Learning

Projects	Project Based Learning
Supplemental to a unit	The project is the unit, or a major vehicle for teaching content standards within a unit
Task is based on following directions from the teacher and is repeated year after year	Task is open-ended and involves student voice and choice; often differs from year to year
Typically done individually	Done in collaboration with a team
Done independently, often at home	Done with teacher guidance, much of it during school hours
Focused on the product; the product may even be called "the project"	The project includes a sustained inquiry process *and* the creation of a product
Not authentic to the real world or to students' lives	Authentic to the real world or to students' lives, or both

Note: We are indebted to Amy Mayer, friEdTechnology.com, for some of these ideas.

Senior Projects and Capstone Projects

Are these project based learning, or not?

In senior projects, students typically choose a topic of personal interest, do research, write a paper, and make a presentation. They may also conduct fieldwork, spend time in an internship or doing community service, or create something tangible—then write a report on it or assemble a portfolio, reflect on the experience, and make a presentation.

Capstone projects are similar to senior projects but culminate a particular course or program. The term is most often found at the postsecondary level, as a final step in a bachelor's or master's degree program, either along with or instead of writing a thesis. The College Board has recently developed an AP Capstone program for high school students, in which they analyze topics through multiple lenses, plan and conduct an investigation, communicate their findings in writing and discussions, and collaboratively solve a real-world problem. A few high schools have students complete a project, often multidisciplinary, at the end of a school year, and these resemble capstone projects. Students who have experienced PBL in their regular classes would be well prepared for the senior or capstone projects they do individually.

Senior Projects and Capstone Projects—*(continued)*

It's true that in both of these types of projects, students are learning by doing a project, which is the basic definition of PBL. And they are to some extent learning something of significance, which is not the case in many dessert or side dish projects. One key feature of Gold Standard PBL these projects might lack is collaboration (with the exception of AP Capstone), because the project and its products are typically done individually. There might be collaboration of a sort, if students meet occasionally with adult experts who give them feedback on their work. But they are not creating something together, as a team.

These are certainly worthwhile learning experiences that share most of the features of Gold Standard PBL. However, if a school said it uses PBL because it has senior projects, and that was the extent of it, we'd say, "Nice start, but. . . ." To say you use PBL, you would have to use it as a common methodology in regular academic courses as well.

Types of Projects

Projects come in many shapes and sizes. Some teachers might prefer one type, based on their own interests, teaching style, or approach to a discipline. Certain subject areas tend to see one type more than another. The students' age, needs, and interests can also be a factor in what type of project a teacher designs. However, all types of projects follow the same basic path and share the same essential elements.

The following sections cover five general types of projects, with examples. Note that some projects might be a combination of types.

Solving a Real-World Problem

Students investigate a problem at their school, in their community, in the wider world, or one modeled after problems faced by people on the job or professionals in a particular discipline. They could simply propose solutions or actually put their solution into effect. Student products could include written proposals and other documents, artifacts, and presentations. This kind of project can be seen in any

subject area but tends to occur less often in history, arts, or literature-focused ELA courses. Here are some examples of problems students could tackle:

- The school has an ineffective waste management system. (See *Systems Thinkers* in Appendix A.)
- Behavior issues are being seen on school playgrounds and in restrooms. (See *Powerful Communities* in Appendix A.)
- A low-income community needs improvement through better land use, investments, and resources. (See *Reimagining South Central* in Appendix A.)
- A local business needs to attract young people to its website.
- Wild animal species are declining in numbers.
- National or state immigration issues need to be addressed.

The problem also could be framed in a fictitious (but still realistic) scenario, as in these examples:

- Investigators try to determine the location of a missing airplane that crashed in the ocean.
- Advisors to the president recommend a response to an international humanitarian crisis.
- Forensic teams determine the adequacy of DNA evidence found at a crime scene.
- Government experts develop a plan for reducing the level of *E. coli* bacteria in swimming areas.

Meeting a Design Challenge

This is a broad category that could range from developing a proposal or plan, to actually creating or constructing something, to putting on a performance or an event. These projects can be found in any subject area but are typically the preferred type in math, science, career/technical subjects, world languages, physical education/health, and the arts. Here are some examples:

- Develop plans for a skate park.

- Build birdhouses to attract birds to the school campus. (See http://pblu.org/projects/schoolyard-habitat-project.)
- Produce podcasts about the history of a community.
- Write a field guide for a local natural area.
- Construct cardboard boats and test them in a pond with passengers aboard.
- Create a modern-day version of *Macbeth* using video and social media.
- Run a business or service, for real or as a simulation. (See http://pblu.org/projects/bizworld.)
- Host community visitors at a celebration in the classroom. (See *Farmer Appreciation Project* in Appendix A.)
- Design new habitats for the zoo. (See *Home Sweet Home* in Appendix A.)
- Draw blueprints for a home renovation. (See *House Hunters* in Appendix A.)
- Design holes for a miniature golf course. (See *Up to Par* in Appendix A.)
- Produce videos to help an exchange student integrate into a French community. (See *An American Student in France* in Appendix A.)
- Cook hard tack candy in the chemistry lab. (See *Sweet Solutions* in Appendix A.)

Exploring an Abstract Question

In this kind of project, students are not focused on a concrete problem or product, but rather on intangible ideas and concepts. These projects are most often seen in English language arts, social studies/history, and sometimes science or the arts; they can also be explored from the perspective of multiple disciplines.

Students can express their answer to the question—which is open-ended, with several possible answers—in a variety of ways. They could create a written product such as a book, blog, letter, report, or magazine. They could create a video or make a presentation with visual aids, or put on a live performance such as a debate, play, speech, or poetry slam. Here are some examples of abstract questions for exploration:

- What happens when two cultures interact?
- Can torture be justified?
- When do we grow up?
- Are robots friends or foes?
- How can art reflect a community?
- Do any human beings ever realize life while they live it? (See *Global Happiness, Local Action* in Appendix A.)
- What makes people take a risk? (See http://pblu.org/projects/choose-your-own-adventure.)

It may seem at first glance that projects focusing on an abstract question are more appropriate for older students, but they can work even for primary-age children. Kindergartners at Heather School in San Carlos, California, considered the question "Should we kill spiders?" (see http://www.scsdk8.org/should-we-kill-spiders-a-kindergarten-pbl-project/). In the *Pizza Shops and the World of Work* project at Mission Hill School in Boston, 2nd and 3rd graders explored the question "What does it mean to work?" by interviewing family and community members; they then created their own two-day pizza restaurant—an example of a project that combined the conceptual with a concrete design challenge.

Conducting an Investigation

This kind of project involves students in answering a question that requires research, data collection, and analysis. It typically occurs in history or science and sometimes math, but it could work in other subjects, too. A report or other piece of writing, an exhibit, or a presentation are common products in these projects. The question could be about any intriguing topic, as long as the answer is complex—and not readily obtainable via an Internet search. Here are some examples:

- Could the British have avoided the revolt of the American colonies?
- What are the best household cleaning products?
- What was it like for my _____ (relative) to come here from _____ (other place)? (See http://pblu.org/projects/back-in-the-day.)

- What can we learn from other people's inspiring stories of resilience? (See http://pblu.org/projects/resilience-café.)
- How might global climate change affect native plant and animal species in our region?
- Do we really need to wear a bike helmet?
- Were the Dark Ages really dark?
- What is the process of owning a home, and what are the economic and social barriers that prevent many from pursuing home ownership? (See *The Home Ownership Project* in Appendix A.)
- How did these rocks get here?
- Why did our town grow the way it did?
- How did technology change the Civil War? (See *Civil War Technologies* in Appendix A.)

Taking a Position on an Issue

Students in this type of project study a controversial or debatable issue, gather evidence, and make an argument. This type of project typically occurs in history, social studies, or science but can be found in other subjects, too, and is often multidisciplinary. Students might produce written documents, conduct a debate, deliver a speech, or make a presentation in these projects. Here are some examples:

- Do we have the right to capture and cage animals? (See *The One and Only Ivan Global Project* in Appendix A.)
- Was the Treaty of Versailles fair to the losers of World War I?
- Should we produce oil by the process of fracking?
- Should President Truman be found guilty of war crimes for dropping the atomic bomb?
- Do police have the right to search our cars?
- Should our county develop its open space and natural areas?

Phase 1: Launching the Project

The project is launched when the teacher conducts an entry event that lets students know this is not just another assignment. The event engages their interest in the project and sparks questions about the topic and the process. After the teacher presents the driving question (or creates one with students), a list of student questions is generated, which will guide the inquiry process. This phase is usually when the project's major products are defined, student teams are formed, other logistical details are discussed, and groundwork is laid for project tasks.

Phase 2: Building Knowledge, Understanding, and Skills

Now the work really begins. Students gain the knowledge and skills required for the project by a combination of teacher-provided lessons and resources, independent investigation, and perhaps contact with experts and mentors. Students ask deeper questions as they learn more.

Phase 3: Developing, Critiquing, and Revising Products

In this phase, students apply what they're learning to develop possible answers to the driving question. The teacher may provide a new experience—a twist in the problem, an activity, additional readings, a guest speaker, a field study, a resource—that leads students to ask further questions. Initial drafts, prototypes, and ideas for products are submitted for critique by peers, the teacher, and experts or users of a product or service. Students then decide if they need to revise their work or learn more, and the process repeats.

Phase 4: Presenting Products

Students arrive at their answer to the driving question and finish creating their product or products. They make their work public and explain the process they used to complete the project. The teacher facilitates students' self-evaluation of their work and reflection on what they learned in the project.

Figure 5.1 Project Path

What Students Think About	PROJECT PATH	How Teachers Support Inquiry
➤ What is the project asking me to do? ➤ What do I need to know? ➤ Why is this important? ➤ Who will I be sharing my work with?	**Phase 1** Launch Project: Entry Event and Driving Question	➤ Conduct entry event and present/ co-construct driving question ➤ Facilitate process for generating student questions
➤ What resources can and should I use? ➤ Can I trust the information I am finding? ➤ What is my role in the process?	**Phase 2** Build Knowledge, Understanding, and Skills to Answer Driving Question	➤ Facilitate use and evaluation of resources ➤ Provide lessons, scaffolds, and guidance in response to student needs
➤ How can I apply what I have learned to the project? ➤ What new questions do I have? ➤ Do I need more information? ➤ Is my work on the right track?	**Phase 3** Develop and Critique Products and Answers to the Driving Question	➤ Help students apply learning to project tasks ➤ Provide additional experiences to generate new knowledge and questions ➤ Facilitate processes for feedback
➤ What should I explain about my work? ➤ How can I best share this with others? ➤ What have I learned and what should I do in the next project?	**Phase 4** Present Products and Answers to the Driving Question	➤ Help students evaluate their work ➤ Facilitate student reflection on process and learning

REVISION