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The Whys and Hows of PBL

"The educator's part in the enterprise of education is to furnish the environment which stimulates responses and directs the learner's course."

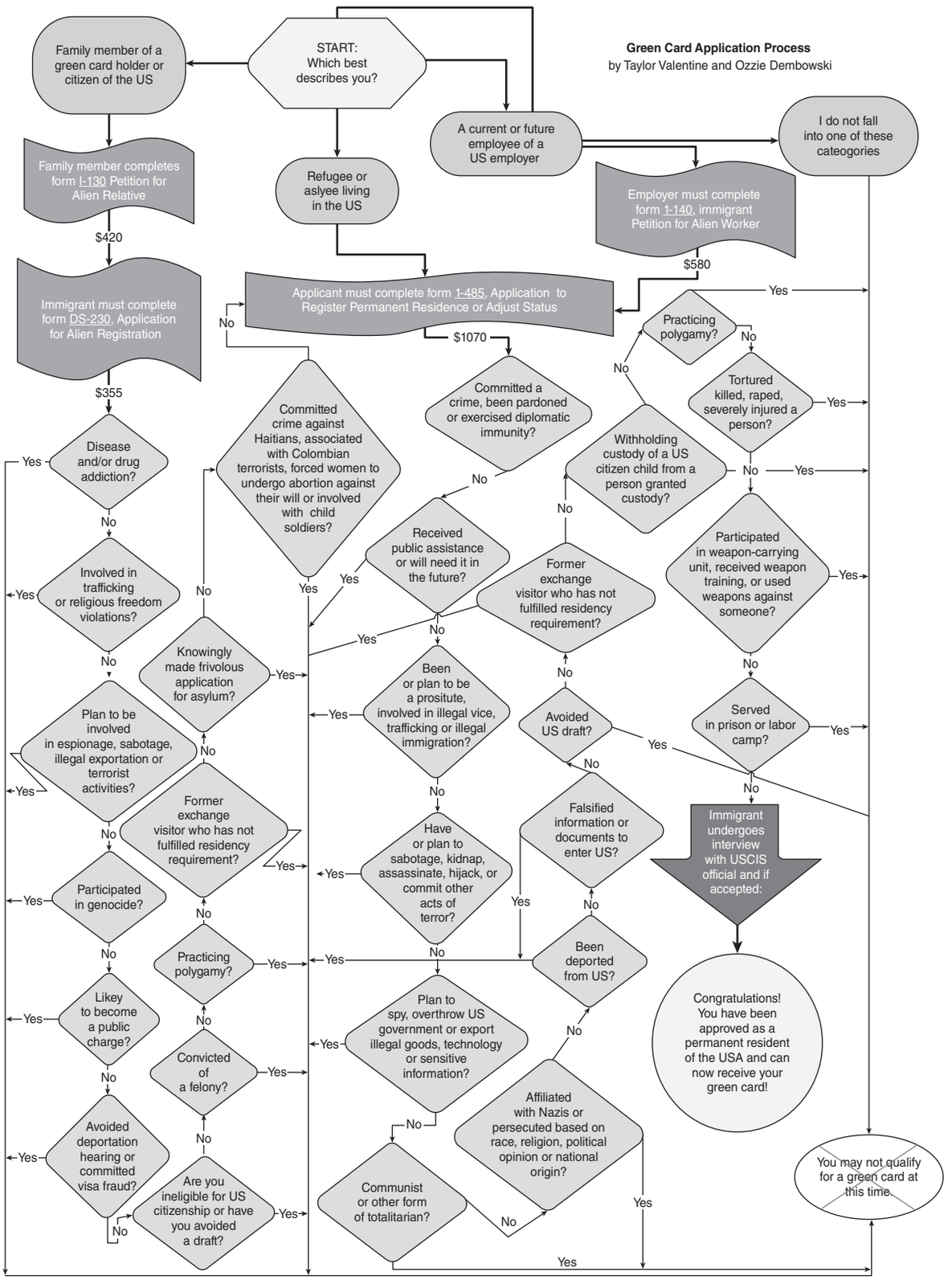
—John Dewey

In Diana Laufenberg's 12th-grade social studies class, students learn about government functions managed by the executive branch. How would you go about teaching this topic? Where one teacher might have students read and discuss Article II of the U.S. Constitution and move on, Laufenberg sees an opportunity for deeper learning. Laufenberg's students interact with federal functions as anyone might who navigates a bureaucratic process. They "apply" for federal student aid or a green card. They make a request permitted by the Freedom of Information Act. Along the way, they analyze each process, present it in a diagram or infographic, and recommend ways the process might be improved. As students share their investigations, the class comes to understand the myriad ways in which citizens interact with government.

Laufenberg's project exemplifies many of the features of high-quality project-based learning:

- It deals with real-world concerns and gets at essential understandings.
- It is personalized; students choose the bureaucratic process they study, often based on issues they are dealing with in their own lives.

Figure 1.1 Green Card Application Flowchart



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- It causes them to inquire, and their investigations require that students grapple with complexity.
- They learn together and from one another, and their learning is meaningful to people beyond school.
- Students are personally affected by what they learn and are likely to remember it.

A student named Grace, for instance, examined the process of getting a green card for permanent residency in the United States. She and her project partner found the process to be so convoluted that they created a flow chart to be able to visualize the many steps (and opportunities for confusion) between application and approval (see Figure 1.1). Let's listen to Grace reflect on what she learned:

> This bureaucratic function has become so complicated because over the years, United States immigration standards have become more exacting. Many believe that if a person cannot complete the process, they do not deserve to be in the U.S.
>
> The most upsetting realization I had was that immigrants go through this process. If my partner and I, both English-speaking seniors, had this much confusion during the process, it must be nearly impossible for a person just learning English to do.

GAIN FAMILIARITY WITH PBL

Beginning with this chapter, you will examine many projects that exemplify the qualities of project-based learning. Before digging into teaching with projects, it helps to establish an understanding of what project-based learning (PBL) is—and isn't. Having a clear definition in mind will help you navigate the PBL process (without the need for a flowchart!).

Project-based learning has been a subject of professional interest for more than 40 years. You're likely familiar with the project approach. Let's begin with your understanding. How would you describe PBL to someone? What opinions would you share about its value as an approach to teaching and learning? Jot down some notes before reading on.

Now, read the description we have crafted (through a process of multiple revisions, informed by our observations) to capture the essential ingredients of PBL:

In project-based learning, students gain important knowledge, skills, and dispositions by investigating open-ended questions to "make meaning" that they transmit in purposeful ways.

Does your characterization of PBL share common elements with ours? Let's unpack the ideas that define PBL.

	Meaning	*So*
In project-based learning,	*The emphasis is on the student experience—learning*	*The teacher does less direct instruction. He or she designs, prepares, and guides projects and learns alongside students.*
students gain important *knowledge, skills,* and *dispositions*	*Projects **are** the curriculum—not an add-on—and through them, students develop important capabilities*	*The teacher designs toward and assesses growth in all three areas.*
by investigating open-ended questions	*Questions activate, arousing curiosity and driving students to inquire*	*The right question at the start leads to more questions—ones that students can investigate.*
to "make meaning"	*The learning is important, unique, and holds value for the student and others*	*Projects elicit higher-order thinking: theorizing, investigating, analyzing, creating, and drawing unique conclusions.*
that they transmit in purposeful ways.	*The form the project takes matches the function it's meant to serve (inventing, entertaining, persuading, motivating, or inspiring)*	*A "loose" project structure allows for creative expression, and transmission of knowledge makes the learning "stick."*

Teachers like Laufenberg use the project approach deliberately and skillfully, with the intention of helping their students develop into knowledgeable, autonomous, and life-long learners. In the brief description of her project, you can see how she helps students investigate questions that matter in their lives. Their research helped them develop a better understanding of how government works. In fact, as students like Grace demonstrate, they are able to think deeply about how bureaucratic processes could be improved. Through PBL, these students are not just studying civics but are developing the skills, knowledge, and dispositions of good citizens.

→Project Signpost 1: Sum It Up

Take a moment to sum up what you think projects accomplish. Capture your thinking Twitter-style—that is, in 140 characters or less. (Example: *Kids learn by doing in content-rich PBL.)*

Sharing a headline or tweet that succinctly captures your thinking is an assessment of your own thinking. In classroom practice, you will want to check in on student understanding frequently during projects, using a variety of formative assessment tools. Mix it up by using exit slips at the end of class, on which students answer a specific question. Or ask them to share a headline or tweet that succinctly captures their thinking (and will quickly reveal any misunderstanding).

What Distinguishes PBL

As you delve into PBL, it helps to be alert to differences between PBL and other forms of activity-based or experiential learning. Two variations worth distinguishing from PBL are thematic teaching and *problem*-based learning.

PBL and Thematic Teaching

Thematic teaching is a practice that organizes learning activities within a theme. Dinosaurs, seasons, survival, Roman times, probability, famous authors, China, and other topics might organize assignments across subjects.

PBL and thematic teaching share common features. A central idea organizes each. Both are meant to be of high interest. Both involve longer-term study—a "unit" of connected learning activities. Thematic teaching and PBL often span multiple subjects.

Occasionally, we have encountered a hybrid approach in which teachers plan successive projects that relate to an overarching theme, such as power or identity. This approach of unifying a course of study under a theme or master question has value. In an Advanced Placement government course design that integrated PBL, for example, several projects related to a single "master question": *What is the proper role of government in a democracy?* Yet each project retained the features of high-quality PBL with inquiry at the core (Boss et al., 2012).

The biggest differences between thematic instruction and project-based learning come down to control, relevance, rigor, and enduring understanding.

Control. As the term suggests, thematic *teaching* is teacher centered. The teacher selects the topic or theme, presents activities for students to do, and makes decisions about the course of study. Students follow their teacher's lead.

In contrast, PBL is student centered. Students have a degree of control over what they learn, how they learn, and how they express their learning. Does student control sound like out-of-control to you? Fear not; with good project design, students achieve the learning aims their teachers intend and, likely, even more.

→Project Signpost 2: Watch Your Step(s)

Be wary of project plans that call for too many scripted steps. Overplanning is a symptom of teacher-directed instruction that's likely to lead to predictable—and possibly mediocre—results. Step-by-step projects leave little room for students to wrestle with uncertainty, raise new questions, or solve problems in novel ways. They are unlikely to challenge students to reach their full potential as capable, creative learners. (In Chapter 5, you will learn more about where to focus your attention for the most effective results in project planning.)

Relevance. When a project is relevant, it touches a student deeply and personally. PBL causes students to look at the world—and their place in it—differently. Thematic projects are interesting, sometimes entertaining, but not necessarily life changing in the way that PBL can be.

Two examples illustrate distinctions of *control* and *relevance* when comparing PBL and thematic projects.

Thematic Project: Insects!

A second-grade class studies insects. Students draw, read, and write about insects. They watch insect movies and do insect math. They learn that insects have defining characteristics and visit insect websites. Each child researches a particular insect, then writes, creates a digital slide show, or dictates a report about it. Students present their reports to the class and celebrate by constructing marshmallow and pretzel insects. They're busy with many hands-on activities, most of which are orchestrated by the teacher. It's thematic teaching with a science focus. Everyone learns a bit of science, but the activities do not add up to truly essential learning outcomes.

Project-Based Learning: The Square of Life

Now let's look at the same topic but with a project-based approach. Imagine a teacher presenting students with a world map and specimens of monarch butterflies and Australian stick insects. He poses a challenging question: *Why here and not there? Why there and not here? How can we find out?* He has registered his class in the Square of Life, an Internet-based collaborative project in which students investigate their local environment and share information with students from around the world. Students select a square meter of local ground to examine. They organize what they find into categories, which they define, such as living and nonliving, plants and animals. Through close examination (facilitated by their teacher but driven by student interest), they organize small creatures into groups by shared characteristics, and learn to discriminate between classes of creatures including insects, isopods, and annelids (segmented worms!). Students theorize about and investigate the role of habitat and niche in species distribution, eventually reaching defensible conclusions that feel like "theirs." They share their findings through Skype with Australian students and report their conclusions about, *Why here and not there? Why there and not here?*

Rigor. These two examples also demonstrate a difference in rigor. In thematic projects, rigor can be wanting. Students often research factual information and report it back as a summary. Activities are connected by the theme but, as we saw in the first case, do not necessarily add up to fundamental understanding greater than the sum of the parts. In contrast, through *Why Here?,* students learn interconnected concepts about classification and habitat that they will return to and build upon as they study science in years to come.

At times, a lack of rigor in thematic projects is masked by digital wizardry. Students may create appealing brochures, slideshows, podcasts, and other media to transmit information, but the content is often the same as can be found in a reference book, on the Internet, or in a traditional report.

In quality PBL, students use technology to investigate and construct new meaning. Technology helps them reach beyond the classroom to a community of learners. Projects like the Square of Life are "Google-proof." Students could not have searched for the right answer online; they had to actively investigate to figure out their own answer to the intriguing question, "Why here and not there?"

Two more examples help illustrate the difference in *rigor*.

Shopping on a Budget

Middle-school students research the question, *How does someone get the greatest bang for the buck when grocery shopping?* With a partner, students devise a healthy 1-week meal plan for four based on USDA guidelines. Next, each partner selects a store, and they comparison shop to find the best price per unit for each ingredient or menu item. Based on their per-item and per-grocery basket comparison, teams reach a conclusion about the most affordable place to shop. They get bonus points if they figure out how to put coupons to work to lower their grocery bill.

This is a good project—relevant to students' lives and connected to core content. But it could be better if it challenged students to think more critically about broader issues. The next project, similar in its intention of having kids use math, understand nutrition, and explore personal economics, is more rigorous and builds civic understanding to boot.

Deserts in Rainy Seattle?

In a project called Deserts in Rainy Seattle?, students ponder the fundamental question, *Is healthy food a right or a privilege?* After examining USDA nutrition guidelines, students discuss how easy or hard it is to meet them. Their teacher helps them arrive at this open-ended driving question: *What are the barriers to good nutrition?* Students discuss, defend their reasoning, and settle on three major barriers: knowledge about nutrition, interest in healthy eating, and access to nutritious foods. For this project, their teacher encourages them to tackle the latter. Pairs identify local "food deserts," neighborhoods where fresh and affordable food is lacking (USDA, n.d.), in which to "shop" for a week's menu using the price-indexed USDA "thrifty" food budget (USDA, 2012). Using Google Maps, spreadsheets, phone calls, grocery advertisements, and actual visits to "desert" neighborhoods, students analyze food availability and affordability, interview residents, draw conclusions about issues of food access, and recommend ways to solve them.

Compared to Shopping on a Budget, the food deserts project challenges students to think more critically about underlying problems affecting healthy food choices, develop possible solutions, use technology for research, and

explain their reasoning with evidence. The first project may sound interesting, but the second involves rigorous thinking and deeper learning.

> *"When you DO something, not only do you learn it better, but it just affects you in a way that I think is a lot more influential in the long term."*
>
> —High school student reflecting at the end of a project

Enduring Understanding. Both grocery projects teach useful, real-world skills. In the food deserts project, however, students are more likely to develop awareness and lasting curiosity about issues of equity and social justice. Not all projects will have this impact, but designing a project with an eye toward enduring understanding is a good aspiration. Imagine your students learning through projects that have staying power because you have used their curiosity as a catalyst for deep investigations. Throughout the book, we will look at ways that social, interpersonal, and extracurricular elements can boost the academic experience and enduring nature of projects.

Project-Based and Problem-Based Learning

Project-based learning overlaps with *problem*-based learning, too. Problem-based learning emerged in medical schools during the 1950s. Finding that medical students struggled to make the leap from academic work to effective clinical practice, teaching physicians at McMaster University in Canada developed the problem-based approach (Barrows & Tamblyn, 1980). Instead of memorizing medical textbooks, future doctors were now learning through clinical scenarios set up to mirror the problems physicians might encounter in daily practice. This shift from knowledge acquisition to problem solving proved effective, and the approach has since become standard not only for medical schools but also in economics, engineering, and many other fields.

There are more similarities than differences between the two PBLs. For starters, similar pedagogic concerns influenced the development of both. Education and social reformer John Dewey advised that treating students as receptacles of knowledge left true intellectual engagement to chance. In 1916, in *Democracy and Education,* he declared, "Education is not an affair of 'telling' and being told, but an active and constructive process" (Dewey, 1997). Both problem- and project-based learning press students beyond knowledge acquisition, causing them to engage in critical thinking in order to construct their own meaning by applying what they have learned.

Both project- and problem-based experiences launch from an open-ended question, scenario, or challenge. Neither states the steps to a solution; instead, they cause learners to interpret and plan an approach they may repeatedly revisit and revise. In the best sense, both PBLs require problem refinement on the way to problem solving.

Both methods ask students to operate in the manner of professionals. In problem-based learning, this has students approaching problems in the way that scientists, mathematicians, economists, computer scientists, and other "pros" do.

In project-based learning, students adopt the "mantle of the expert," too, but even more broadly. Depending on the project, they might function as scientists or mathematicians, travel agents or museum curators, citizen advocates or manufacturing consultants, documentary filmmakers or social scientists. In projects, students are likely to read, research, work in teams, consult experts, use a variety of technologies, write, create media, and speak publicly in the process of the learning cycle.

Distinguishing Problems From Projects

For the purposes of this book, the biggest differences between the two PBL approaches have to do with the focus, duration, and outcomes of each.

A problem-based inquiry frequently focuses on a mathematics or science problem, and study is completed in one or several class periods. Project-based learning is often intentionally interdisciplinary, and the duration of a unit of study may range from several days to multiple weeks.

In problem-based learning, the path to answers might vary, but there is a desired right answer (or answers) at the end. In project-based learning, the processes, and thereby the outcomes, are more diffuse. In a project, the learning path and work products can be as unique as the students or teams that engage in it. Many teachers who advocate for project-based learning will tell you they set a standard for minimally acceptable outcomes and are often surprised and pleased to find students' work exceeding their expectations in both creativity and quality.

To illustrate the subtle differences between the two PBLs, here is a contrasting example of each. Ask yourself, which is problem based and which is project based?

The Floor Covering Scenario I

You have been asked by your mother to suggest a covering for the floor of your room. The room is rectangular and measures 4.3 m by 3 m. There are three ways to cover the floor. You can use a carpet, a mat, or tiles, but each is of different dimensions and price. The entire project, including additional materials and labor, has to stay within a budget of $600. Explain clearly and mathematically your best choice and how you arrive at your decision. Drawing diagrams may make your explanation clearer.

The Floor Covering Scenario II

One day, Mr. Abert brought a carpet remnant to class. He'd found the scrap among a large pile of used carpeting being removed from the floors and hallways of a local office building. All the discarded flooring was in a dumpster, headed for the landfill. The project begins with students estimating how much carpet, by volume, is destined for the landfill. They go on to look at issues of—and solutions to—dumping carpet and other bulky, composite waste. Their research turns up examples of how different

communities around the globe are diverting bulky waste from landfills. After reading about a project in the United Kingdom that recycles carpeting and food waste and programs in the United States that deconstruct used mattresses and construction debris, students look for opportunities in their own community. The project continues with students working with a reuse and recycle center to find ways to source, clean, donate, place, and even advertise and resell used carpeting.

The first example falls in the range of "problems" while the second is very much a project. With good design, the second example addresses the learning objectives of the first (imagine students working with clients to measure and place quantities of carpet), while taking it further—into the world of math, and into the *world.*

Inquiry in Project-Based Learning

A good project sets up conditions in which students are compelled to inquire. Inquiry is the personal path of questioning, investigating, and reasoning that takes one from not knowing to knowing. Given the right opportunities, students doing projects become accustomed to inquiring—looking for patterns, analyzing systems, scrutinizing processes, exploring relationships, and solving problems. In the next chapter, we'll explore in more detail the conditions that give rise to inquiry.

Exercise: What do you wonder about?

In this chapter, you have heard descriptions of four projects: Navigating Bureaucracy, Square of Life, Deserts in Rainy Seattle, and Floor Covering Problem II. Select one of these projects for closer consideration. (Suggestion: Pick the project that you wish you had been able to do as a student.)

We have provided you with only a summary description of each. Jot down your thoughts as you consider these questions:

- What do you like about this project?
- What do you wonder about? What might be challenging about doing this project with your students?
- What would you expect your students to know or be able to do by the end?
- If you could interview the teacher who designed the project, what else would you want to know?

WHAT'S NEXT?

Now that you have a good working definition of PBL, along with a few project examples in mind, you're ready to dive deeper into your exploration of inquiry. In the next chapter, you'll consider why humans are such curious creatures, how traditional schooling can extinguish the spirit of inquiry, and what you can do to rekindle your students' questioning nature.