



# Authentic Project-Based Learning with Digital Portfolios

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# Introduction

When you hear the word 'project,' what comes to mind? Do you remember any projects you were assigned when you were a student? Was your most memorable learning experience tied to a school project or some other event in your life that required you to solve a challenge? Take a look at the progression of our responses. Chances are your answers to these questions are similar to ours.

**DAYNA:** The first recollection I have of doing a project was in the sixth grade. To be honest, I don't remember much about the specifics of the content or the goals behind completing it. It was assigned in social studies class, and I know we had options for the final product. My final choice was a crispy rice treat fashioned into the shape of a large pyramid. My mother made the pyramid, and I vaguely recall having notecards with facts about the pyramids that I recited to the class. If memory serves me correctly, my classmates were more interested in eating the deconstructed rice crispy treat pyramid than in listening to my presentation.

**JILL:** The science fair in third grade is the only memorable thing I recall doing in school. The science fair, for me, was the first time learning in school had a real-world purpose. You see, at six-years-old, school had already turned me off. I was the annoying student who never stopped asking why and looked for any reason to disqualify or find loopholes in the rules. It was also the first year I was suspended for insubordination, which was a fancy way of saying I didn't listen to my teachers very well.

The science fair was the first opportunity for me to apply real-world thinking to what I was learning. I could ask all the questions I wanted, write them down, and look for the answers. I had the opportunity to design and conduct my own investigations without the teacher telling me exactly how to do the work. I knew the outcomes, but the process was flexible. I loved every second of investigating how cacti thrive in the desert. I was thrilled to go through the scientific method and draw my own conclusions to present my findings. I had many holes in my fingers from the cacti, but I learned so much through trial and error.

**US:** Fast forward a few decades to when we joined forces with a third partner to form our own consulting business. We truly entered into a project-based learning phase, as we had to figure out how to start the business. We had to create our own bylaws and a memorandum of understanding to regulate our work as a trio. Since we work across the country and internationally, we had to learn about business registration regulations in every state in which we worked. We had to learn about writing contracts, invoicing, and paying taxes. And, of course, we had to build a product and a brand. Needless to say, we still learn, adjust, and create every day.

As the pages of this guide unfold, you will see the differences between what we have traditionally labeled as projects and true project-based learning (PBL). The notion of real-world work comes from our everyday lives. It's not about students always being happy while they work but it's about being empowered because there is a reason for knowing the content. We will take you through the what, why, and how of PBL to get you started on your journey of teaching transformation. As you read, ask yourself what shifts you may need to institute in your own classroom to bridge the gap between projects and PBL.

In this short publication, we realize we are only able to provide you with the basics about PBL. To become a PBL expert, it takes a lot of trial and error in the classroom. Believe us, we both have had plenty of moments that did not go quite as planned and we learned so many lessons from those moments. There are also a plethora of amazing experiences that resulted for both our students and us. Additionally, we have had the fortune to participate as coaches with so many teachers who have implemented their first, second, and even twentieth PBL experiences. In each instance, we learned something new about how to design, plan, implement, and assess the PBL experience. In fact, we continue to learn with each new interaction in which we are fortunate enough to participate.

# The What And The Why

## The What

### WHAT IS PBL?

You are probably already forming your own opinions about project-based learning based on what you already know and what you're reading now. In fact, there are a lot of definitions of PBL out there, but the one from which most others are derived comes to us from Krajcik and Blumenfeld (2006). The pair illustrated PBL as a situated learning experience that encompasses the following components:

- Investigation of authentic and relevant questions
- Inquiry-based process to develop thinking
- Collaborative discussions and sometimes lively debates with peers, teachers, and experts
- Learner proposed solutions
- Creation of artifacts to address the initial question.

## WHAT IS THE HISTORY OF PBL?

This definition of project-based learning finds its roots in Dewey, Kilpatrick, and Vygotsky, among others. Dewey, at the turn of the twentieth century, had already established the University of Chicago's Laboratory School where the focus was on the natural curiosity that children possess and the process of learning that stems from that curiosity (Mayhew & Edwards, 1936). This inquiry-based approach to learning promoted community interaction so that learners could become a part of their own neighborhoods (Dewey, 1916). Kilpatrick (1918), in one of the first steps toward modern-day PBL, published the "project method" approach that advocated a departure from traditional project activities and a move toward purposeful education to tap into the interests of learners. The project method was intended to foster a more student-centered approach where the teacher facilitates the process but the students drive the learning through inquiry. Vygotsky (1978) founded social development theory to link social interaction and community as the two main ingredients necessary for cognitive development. Thus, children make sense of the world in which they live by these social interactions, which include communication and collaboration (Shunck, 2012), two of the hallmarks of a PBL environment.

## WHAT ARE SOME CLASSIC EXAMPLES OF PBL?

We are fortunate that our work with teachers has taken us across the United States and to many corners of the world. Through this work, we frequently encounter some tried and true examples of PBL. These may be a starting place for you as you consider diving into the world of PBL. Remember, however, to do what works for you, as a shift in your teaching pedagogy to one that encompasses PBL will not happen overnight.

One of the most popular examples of PBL is to have your students grow their own gardens. While this example has the potential to become just another project instead of full-blown PBL, we like it because it can be used across many grade levels and encompass a variety of content areas. However, the purpose of the garden must first be established and can then be related to any number of things that might include providing food for the school cafeteria or teaching students how to develop sustainable food practices at home. We have worked with kindergarten teachers who use this project-based experience to teach science, math, reading, and writing. Students can grow their own vegetables from seeds and chart the measurements of their growth. They learn the parts of a plant and what plants need to flourish. They can harvest their lot and use it to create their own culinary feast. Throughout the process, they read about all things related to gardening and write journal entries about the changes in the plants while

they make predictions about what is to come. At higher grade levels, we have worked with classes who design their own beds, develop greenhouses made from recycled materials, and even create aquaponics programs. We even had an AP environmental science teacher develop a project around the successful elimination of aphids in their gardens.

It seems in every district to where we travel, there is always a space in need of a redesign. You name it; we've seen it: courtyards that are bare or overrun with weeds, playgrounds that can be revamped, auditoriums that need to hold more students, or classrooms that desire to be more conducive to a 21st-century style of collaborative learning. In any case, just like the garden example, we like how teachers and students can take a diverse approach to the plan and execution of this PBL experience. This also lends itself to all grade levels and content areas. Higher-level math classes can get much more involved and may even design a space from scratch, while mid-level elementary grades might only work with area and perimeter. A cost analysis can be an added component to this PBL unit and from an ELA perspective, a written proposal or oral presentation to the administration or school board is not out of the question. Depending on the redesign of the space, we might see science components added into the project. Perhaps, physics content comes into the mix with the playground equipment or for environmental science a natural habitat may be disturbed if students aren't careful. Social studies can also be brought into the project with the research of the history of the changes at the school over the years or how the redesign of the space better promotes community interaction.

#### **WHAT RESEARCH AND EXAMPLES DEMONSTRATE THE IMPORTANCE AND VALUE OF THIS PEDAGOGICAL PRACTICE TO IMPROVE STUDENT OWNERSHIP AND OUTCOMES?**

For us to see the real effects of PBL in a classroom, school, or district, we must use PBL as the primary focus of the curriculum (Thomas, 2000). There are few longitudinal studies that exist on the effects of PBL in the classroom, however, West Virginia implemented a statewide PBL initiative from 2008 to 2010. Here, core teams of teachers were trained over the course of three summers in the PBL methodology, implemented projects within their classrooms, and subsequently trained other teachers in the state (Hixson, Ravitz, & Whisman, 2012). It was discovered that teachers trained in this methodology reportedly integrated more 21st-century skills into their classrooms (Hixson, et al., 2012). The study's teachers reported students were more motivated in class and could apply and transfer their learning to new situations (Hixson, et al., 2012). Additionally, students performed at least as well as their non-PBL counterparts on the state standardized tests (Hixson, et al., 2012).

PBL has been found to work for students of all levels and in a variety of content areas. A study on mixed-ability groupings in a PBL environment showed students with special needs have the potential to increase motivation and confidence when interacting with their peers (Belland, Glazewski, & Ertmer, 2009). Schools that are diverse in location and socio-economic backgrounds, that house different types of learners, benefit from the implementation of PBL (Hixson, Ravitz, & Whisman, 2012). PBL, when implemented in pre-kindergarten through the twelfth grade, can provide an environment that results in increased understanding of content of multiple disciplines, as well as expanded engagement with the manipulation of that content (Holm, 2011). Finally, and perhaps the most telling findings were determined by Boaler's 1998 longitudinal study of mathematical outcomes in the United Kingdom. Students in the PBL math classes, over a three-year period, were found to have outperformed their non-PBL counterparts in school and national examinations (Boaler, 1998).

#### **HOW HAS TECHNOLOGY IMPACTED PBL OVER THE LAST 20 YEARS?**

Digital learning permeates our world and everyday life. We rely on our phones for the latest updates to weather, news, and social media. It is a natural extension of our being. As a tool, technology has the ability to revolutionize the way in which we do school. We recognize it as hardware, software, and applications to support the pedagogical foundations of PBL and to bring transparency to the thinking and learning process that happens in PBL. Whether you are fortunate enough to teach in a one-to-one computing school or if you simply share a few carts of computers among many classrooms, technology makes an impact on how you teach and how your students exhibit their learning.

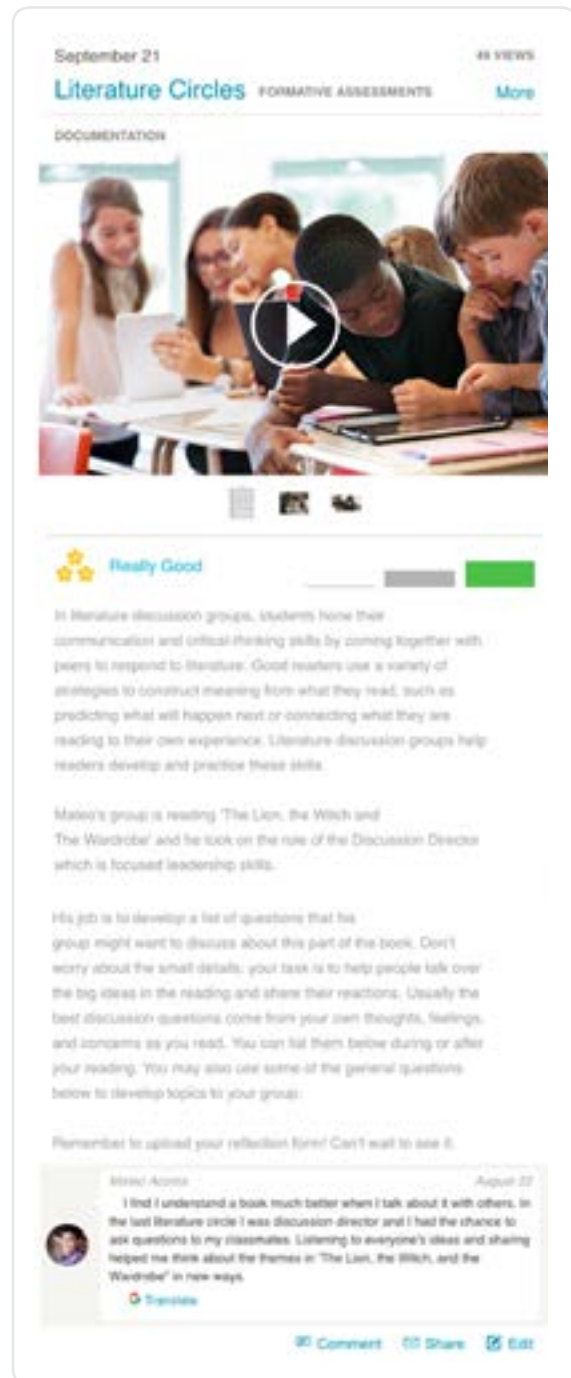
Technology tools can bridge all content areas and grade levels to open the doors to cross-curricular or multi-year projects. These digital tools have the ability to impact a PBL classroom in multiple ways. Students now have access to software and apps for the production of products, for use in their personal reflections on their work, and for data collection to justify their solutions to given challenges. Students and teachers now have the capability to create and innovate in ways that were unheard of twenty years ago. The merger between PBL and technology is not simply about the acquisition of the apps, software, and hardware; rather it is about how the technology is used to support students as they tell their story of learning and demonstrate that learning.



## USING TECHNOLOGY TO ENHANCE THE PRACTICE OF PBL

Practitioners who design PBL experiences and their students, who are empowered by them, use technology to express their creative and innovative ideas through the digital tools they choose. For example, artifacts and products created by students may be animations through media or collaborative proposals written via a shared document both of which can be immediately shared across the globe. Many projects might utilize subject matter experts to give learners feedback via teleconferencing, teacher-moderated discussion boards or social media.

Today, projects can be fully developed and executed online. While technology integration is certainly not a requirement of PBL implementation, technology has changed the approach to what a final product can look like, the ways in which it is shared beyond the classroom walls, and the connections it fosters through collaborative learning. Although projects can be done without the use of technology, the utilization of technology does provide an expansion to the range of products, artifacts, and presentation options for students. Technology can prompt learners to go beyond regurgitated facts listed on a poster as a presentation of their work. Instead, a PBL environment pushes students to move toward an exhibition of deeper learning through their creativity and innovation in more relevant, personal ways. Technology can also support the management of a PBL experience.



The screenshot shows a FreshGrade post from September 21 with 48 views. The title is "Literature Circles" under the category "FORMATIVE ASSESSMENTS". The post includes a video thumbnail showing a group of diverse students in a classroom setting, with a play button icon overlaid. Below the video, there is a section titled "Really Good" with a progress bar. The text describes literature discussion groups and mentions a student named Mateo who is reading "The Lion, the Witch and the Wardrobe" and acting as the Discussion Director. It details his role in developing questions for his group. At the bottom, there is a reflection form from Mateo, dated August 27, where he shares his experience as a discussion director and how it helped him think about the themes in the book in new ways. The post also includes "Comment", "Share", and "Edit" options.

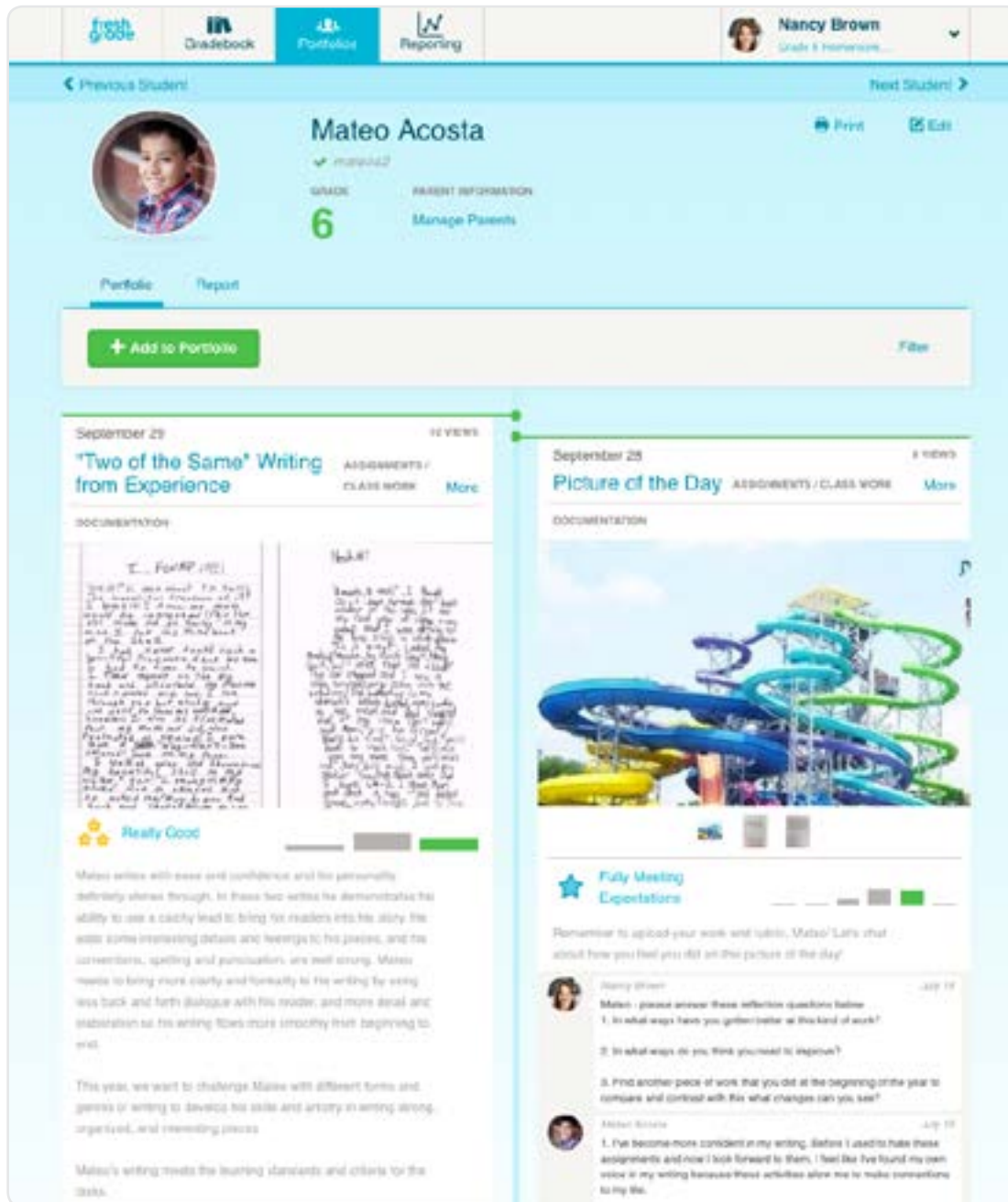
Mateo's teacher has provided detailed notes to capture and document his work in class using the FreshGrade for Teachers app. Mateo has uploaded his reflection form and responded to feedback with a comment via the FreshGrade for Students app.

A learning portfolio platform such as FreshGrade can help support the PBL experience through feedback, student self-reflection, and personalized learning. Using FreshGrade, students have the ability to choose and upload artifacts in a variety of formats to their portfolio and self-reflect in comments. Teachers have the option to provide detailed feedback on a student's learning via anecdotal notes or assess the artifact through assessment tools or customized rubrics. Parents also have access to student work, which creates a holistic approach to student success. In addition to increasing collaboration through student self-reflection and teacher feedback, technology can help teachers better manage and personalize the learning that students do throughout a PBL experience. Within the FreshGrade platform, they can create and house advanced or more supported activities for each student, as needed and reuse them for other students. If you have ever struggled with keeping track of group and individual contributions, standards met throughout a project, or the simple management of the project, technology can now be a solution for this. Teachers can better manage and personalize the learning that students do throughout a PBL experience. In FreshGrade, they create and house advanced or more supportive lessons for each student, as needed. If students are asked to create a recorded presentation, FreshGrade provides the platform to upload the session for student playback and critique. Finally, the sharing of these finished products can be managed via FreshGrade as all of the students in a group are tagged and thus are made available to their parents or other viewers.

#### **HOW DO DIGITAL PORTFOLIOS ENHANCE PBL?**

During the PBL process, it is beneficial for the learner and the teacher to visualize the progression of improvement as they work through the challenge using the content. We want our students to tell a story of their learning. The use of a portfolio is the perfect medium to do this. While the idea of using a portfolio is not new to education, often, the portfolio only contains the best final products over the course of a semester, a year, or a school career. Through the use of a digital portfolio, we now have the online space to provide our learners with the guidance to structure their initial thoughts, reflections, and modifications made to the project experience, over time. A student-owned and student-centered digital portfolio can encourage students to clearly articulate their learning, as well as to identify future learning goals and how they will attain those goals (Tosh, Light, Fleming, & Haywood, 2005). They can submit multiple drafts of a product and provide reflections about the changes made to the product. Justifications for changes are articulated through this process and a variety of ideas, feedback received, and documents researched are intertwined to tell that story of learning. For each draft, an accompanying journal entry is the insight into what a student has developed over the course of a project. The collection

of materials in a portfolio documents a student's progress over time. It provides a window into that learning process as outsiders have the ability to preview student thinking and the outcomes of the learning (Zawacki-Richter, Hanft, & Bäcker, 2011).



As the student learns and grows, their growth is reflected in their FreshGrade portfolio. Here Mateo and his teacher compare two pieces of writing and comment on his work. These examples tell a story of Mateo's learning.

# The Why

## WHY PBL FOR STUDENTS?

Dewey (1916) argued that students are more engaged in learning when the work they are asked to complete is authentic and relevant to their life and emulates what subject matter experts are doing. The development of a PBL unit provides the perfect opportunity to connect your standards and content to a real-world challenge that brings meaning to the work we ask students to tackle. A PBL experience utilizes the inquiry process and engages students throughout the process as they pursue solutions to a given challenge. Students ask and refine questions, make predictions, experiment and prototype, debate ideas, and analyze data to ensure their solutions are viable. All of these characterize their pursuit of finding a solution (Laur & Ackers, 2017). Whether a photo, video, or voice recording, the artifacts developed by students give them the opportunity to communicate their ideas and findings to others. A solid PBL unit plan creates value for the standards and learning outcomes through the real-world challenge. It is this link between the authentic challenge and your discipline where students find ownership in the work they create. Ownership of the challenge gives students a reason to use their problem-solving skills, a productive way to negotiate

This real-world problem provides Mateo with the opportunity to pursue meaningful solutions.

The screenshot shows a project page on the FreshGrade platform. At the top, it displays the date 'September 27' and '4 VIEWS'. The project title is 'Preparing for Hurricane Harvey' with a 'PROJECTS' tag and a 'More' link. Below the title, there is a 'DOCUMENTATION' section featuring a collage of text about tornadoes, including phrases like 'tornado is formed', 'The flying debris is the most dangerous part of a tornado to people', and 'Tornado Alley'. A progress bar indicates 'Meeting Expectations' with a green checkmark and a green bar. The 'TEACHER FEEDBACK' section contains three comments from a teacher, praising the student's thought process and communication. Below the feedback, there are three student comments from 'Mateo Aceves' dated July 20, discussing his understanding of the problem, areas for improvement, and how he plans to tackle the challenge.

the meaning of a challenge by building on each other's experiences and knowledge, and provides a purpose for co-constructing solutions using your discipline. Your curricular requirements are now designed to encompass all the content, skills, and collaborative experiences needed for students to be successful.

For student success, it is imperative that teacher support is in abundance. Nearly two decades ago, Dr. Seymour Papert (2001), noted teachers must learn alongside their students in order for the process of PBL to be effective. In a PBL environment, the focus is less on the teacher and is instead shifted to the student. The teacher no longer needs to have all of the right answers. In fact, in a truly open-ended challenge for students, there should be multiple right answers as long as the student provides justification for their chosen one (Laur, 2013). This is an important feature of PBL, as students now have the freedom to explore a variety of pathways as they arrive at their determined solution. Rather than being told what to memorize for an end of the unit test, students jump into the PBL experience with both feet but have their teacher as the compass to guide them when they chart off course.

#### **WHY PBL FOR TEACHERS?**

In today's world, it is imperative for students to make connections between what they learn in school and the challenges they will face in the world beyond the school walls. PBL provides the context for making the connection between the two. As we close out the second decade of the 21st century, it becomes increasingly difficult to teach our children in a traditional manner, as the traditional world no longer exists as it once did. While the shift to the implementation of PBL can be a long process for some, PBL has the potential to become the sole focus of the classroom that can envelop all other school and district-wide initiatives.

Many pedagogical practices, premade curriculums, and textbook-developed simulations are viewed by teachers as add-ons to their already exhausting day of planning. Thus, a shift to a PBL approach to teaching provides an opportunity to reframe the way in which the curriculum is delivered. In doing so, academic freedom abounds, as the ideas for PBL experiences are limitless. Crafted by the teacher, these experiences address the requirements of the course. At a more advanced level, students may create the PBL experience based on interest and course connections. However, a co-created event provides an opportunity for both teacher and student to tap into the innovative learning that is possible when experience meets curiosity. Therefore, the teacher's role in a constructivist environment is that of a learner who models and scaffolds just enough to spark curiosity but not do all the work.

#### HOW DOES PBL ENHANCE OTHER PEDAGOGICAL PRACTICES?

Project-based learning is most successful when delivered in conjunction with other pedagogical practices. The pedagogical strategies and learning activities that have been proven to support learning also foster the structures and conditions needed to implement a PBL unit effectively. You may already be familiar with an inquiry-based learning approach or design thinking. Perhaps your district or school has adopted a STEM or STEAM focus to their curriculum. In any case, PBL is an all-encompassing pedagogy that brings together the others in a more holistic approach to student achievement. You can easily design a PBL experience to reflect the tenets of any other pedagogy.

The cyclical or iterative inquiry process that is the hallmark of PBL relies on scaffolding, formative assessments, and teacher support. Here, we want to emphasize that PBL should not be confused with the pure form of Bruner's discovery learning in which students are provided little to no assistance as they uncover concepts on their own. Rather, a PBL approach embraces a constructivist methodology to education that requires a teacher to be the pillar of support for students. Now, your daily lessons, already designed activities for your unit, and assessment practices have the potential to become the scaffolds for your newly created PBL experience.

In PBL, we make the shift to now begin a unit with a challenge for our students. Without any guidance or pre-teaching in the beginning, students use their prior knowledge to help make meaning from the challenge. From here, they begin to make personal choices and brainstorm how they might want to tackle the challenge. Then, daily lesson plans that previously may or may not have connection to one another provide the support necessary to students when and if they are needed. Thus, continual formative assessments become the key to unlocking the needs of our students. From these formative assessments, we have the ability to make changes to our daily instruction in response to those needs for individuals, small groups, or a whole class of students. Thus, students make meaning of each lesson and activity as they aid them in solving the given challenge.

#### HOW DOES PBL WORK WITH RESEARCH AROUND STUDENT OWNERSHIP AND VOICE/CHOICE?

Well over a decade ago, Krajcik and Blumenfeld (2006), called to the attention of educators that students of all ability levels were bored in school due to a flaw in the structure of the system. The pair also noted that only cursory understanding of materials were found by even the best students as they left high

school to attend some of the premier universities in the country (Krajcik & Blumenfeld, 2006). A shift in our approach to teaching and learning was clearly needed.

PBL provides a definitive opportunity for students to shift from the role of passive learner to one of active constructor. From the undertaking of Dewey's promotion of teacher leadership to encourage student inquiry to Kilpatrick's purposeful approach to learning, we find that PBL opens the door to student voice throughout the learning process. How do we encourage this in our classrooms? We can start with an increase in the number of decisions your students make during class time with you and within the learning space. This allows you to think together and capture your students' ideas with yours. You are the key to helping students take action using your content. A co-creation and brainstorm process, together in PBL, allows for voice and choice without straying from standards and learning outcomes for the project. We accomplish this by not over planning lessons before the entire PBL experience begins. We want to be flexible enough to meet the needs of our learners as the project unfolds and they discover new paths of inquiry. However, if we maintain a focus on the content by making all the learning experiences align to the challenge and purpose of the project, we still have plenty of opportunities to create allowances for voice and choice, which lead to increased student ownership. By making small changes, we model and encourage the behaviors that move students from compliance to creator.

October 2 2 views

### Mathalicious - New-Tritonal Info instructorsMore

DOCUMENTATION

**Azz Mateo**

Many restaurants are required to post nutritional information for their foods, including the number of calories. But what does "500 calories" really mean?

In this launch activity, students use unit rates and proportional reasoning to calculate how long people would have to exercise to burn off different McDonald's menu items. They then discussed what they think would happen if, instead of calories, McDonald's wrote its menu in terms of exercise.

Mateo - Please upload your group video and explain your thinking.

**Mateo Acosta** July 20

Our group researched if you ordered a Big Mac, Large Fries, and Large Coke how much exercise you'd need to work that off.

For 1300 calories you'd need to do the following exercises (with hours):

- 1) Yoga - 6 hours
- 2) Strength Training - 6 hours
- 3) Dancing - 4 hours
- 4) Running - 2 hours
- 5) Walking - 4 hours
- 6) Biking - 2 hours
- 7) Rollerblading - 3 hours
- 8) Cardio Equipment - 2 hours

We then researched healthier food options and how much you'd have to eat to get 1300 calories and found the following:

- 1) Asparagus - 300 stalks
- 2) Bell Peppers - 52 Peppers
- 3) Broccoli - 30 heads
- 4) Carrots - 443
- 5) Cauliflower - 9 medium heads
- 6) Cucumbers - 443

[10 Comment](#) [5 Share](#) [Edit](#)

Here, Mateo has uploaded his group video via the FreshGrade for Students app and has demonstrated his thinking process through comments.

September 13 3 VIEWS

## Flat Stanley Community Heroes - Group Discussions

PROJECTS More

DOCUMENTATION






---

 Really Good \_\_\_\_\_

Today during our small group discussions students generated a corresponding list of community hero actions that can help solve the problems they identify.

Students came up with the following community actions:

- pet adoption event
- spay/neuter pet event
- trash/beach/park/courtyard cleanup
- electronics recycling event
- toy drive for children's hospital/needy children
- food drive for a homeless shelter
- anti-smoking campaign
- book drive for the library

 Comment
  Share
  Edit

The Flat Stanley Community Heroes Group discussion captures ideas that can help solve community problems that they have identified. Here, the teacher is able to upload the project work to multiple portfolios at the same time, tagging all students who were involved in the discussion.

September 13 3 VIEWS

## Flat Stanley Community Heroes - Group Discussions

PROJECTS Less

ACTIVITY DETAILS

● Term 1 ● Collaboration ● Creativity

Project Idea:

Students are passionate about helping others and their communities. In this project, students will use Jeff Brown's famed and beloved Flat Stanley character to connect with different communities and inspire students to be heroes for a community cause. They will create Flat Stanley Ambassadors to challenge students in other communities to solve a problem, and do the same with Flat Stanley Ambassadors they receive from a partnering classroom. They will perform a community hero action and gather data to measure their impact. Their work will be published in an online magazine that will be shared with a wide audience and dedicated to someone in their community who they were able to help.

Challenging Problem or Question:

The Flat Stanley Community Heroes project compels students to face a real problem or issue in their community. They will challenge other students in their city, state, country, or even somewhere else in the world to join them in finding solutions to local but universal problems that span pollution, health, animal welfare, and homelessness. Students' community actions will also be guided by a driving question, which they will return to throughout the project.

Sustained Inquiry

This project requires students to sustain an investigation into community issues and research their problem or issue in both team and individual settings. By using online resources, talking with living resources, and gathering information from selected texts, students will continually enrich their understanding of an issue about which they care deeply. By diving deeply into the content, students will gain a sense of ownership over the project and be inspired to fulfill the challenge.

Language Arts

- Writing
- Listening & Speaking
- Reading



## WHY PBL FOR SCHOOL LEADERS?

Major shifts in school innovation and culture have happened and will continue to happen. The one thing that remains constant is our accountability for student achievement. Constructivist Leadership is defined as the “reciprocal processes that enable participants in a community to construct meanings that lead toward a shared purpose of schooling” (Lambert, 2002, p. 1). The school leader’s role as the instructional and administrative head is to ensure students and teachers feel supported through the inevitable changes and transitions that come as they move toward a more constructivist style approach. Leaders who pose questions and frame actions, along with the application of constructivist learning strategies and their supporting technology applications, can help their school accommodate the PBL perspective to answer the learning needs of the 21st-century. This bridges the gap between leaders and teachers to alleviate the mentality that a pedagogical practice must be sold to staff or conversely one that the staff needs to sell to the leadership team. Ultimately, this helps to eliminate the “us versus them” outlook that can potentially permeate and devastate a school culture.

Constructivist learning and PBL personify personalized learning and differentiation because they allow flexibility for learners to acquire knowledge at different rates of depth and breadth. The same holds true for a leader when implementing a new initiative such as PBL. Leaders collaborate with teachers to create a shared vision around constructivist and inquiry learning (Vander Ark, Latham, & Liebttag, 2016). The same flexibility afforded to learners in the classroom is given to the teachers as they acquire the knowledge and skills to implement PBL in their classrooms. This is how leaders work collectively with teachers to develop their shared vision, which is central to the attainment of student achievement. This means teachers and leaders understand that PBL implementation becomes the central focus of the curriculum.

Educational environments with a mission to develop citizens who are ready for college and careers of the future make decisions based on all their students’ well-being (Vander Ark, et al., 2016). Schools that make student advocacy and equitable access central to all their decisions ensure a high-quality education for all learners. Inherently, these are roles that must be promoted by effective school leaders to achieve balance in a PBL environment. The same holds true for leading effectual professional development and modeling educational practices in their own schools. Exemplary leaders utilize these two areas to ensure they offer their teachers the opportunity to practice the essential inquiry, communication, and problem-solving skills they aspire to see students engage in as they prepare for them for college and a career.

# The How

## Level One

### HOW DO I GET STARTED WITH PBL?

The best part about diving into PBL is that you do not have to start from scratch! We do not advocate that you completely throw out all of your old units, lesson plans, and activities. You may even find some of these are great entry points or lessons to integrate into a PBL experience. In fact, all of your tools, knowledge, and prior experiences are the foundation for how you scaffold the learning, plan for critical thinking, and assess your students' abilities. You are already doing amazing work in your classrooms. However, there are a few considerations to make as you begin to shift your classroom experience toward a more project-based approach. The foundation of making this shift to PBL reverses the guided release model designed by Doug Fisher and Nancy Frey (2007) from an "I do, we do, and you do" model to a "you do, we do, and I do" approach to instruction.

We each start our PBL journey from a different set of experiences. Whether you are a first-year teacher or a twenty-year veteran, we have found Krajcik and Blumenfeld's (2006) five key features to PBL to be a helpful starting point to approach PBL in a constructivist manner. If you do a comparison of any current day PBL models, you will see they are derived from these five key features. They are a great foundation to help you design and build authentic projects to use in your classroom.

## 5 Steps of Project-Based Learning



**1. IDENTIFY** a unique challenge or a problem to be solved



**2. INVESTIGATE** the challenge using the inquiry process as students learn and apply ideas in the discipline



**3. EXPLORE** the ideas and challenge them through collaborative activities with students, teachers, and the community



**4. UTILIZE** the inquiry process to refine products based on peer, subject matter experts, and teacher feedback



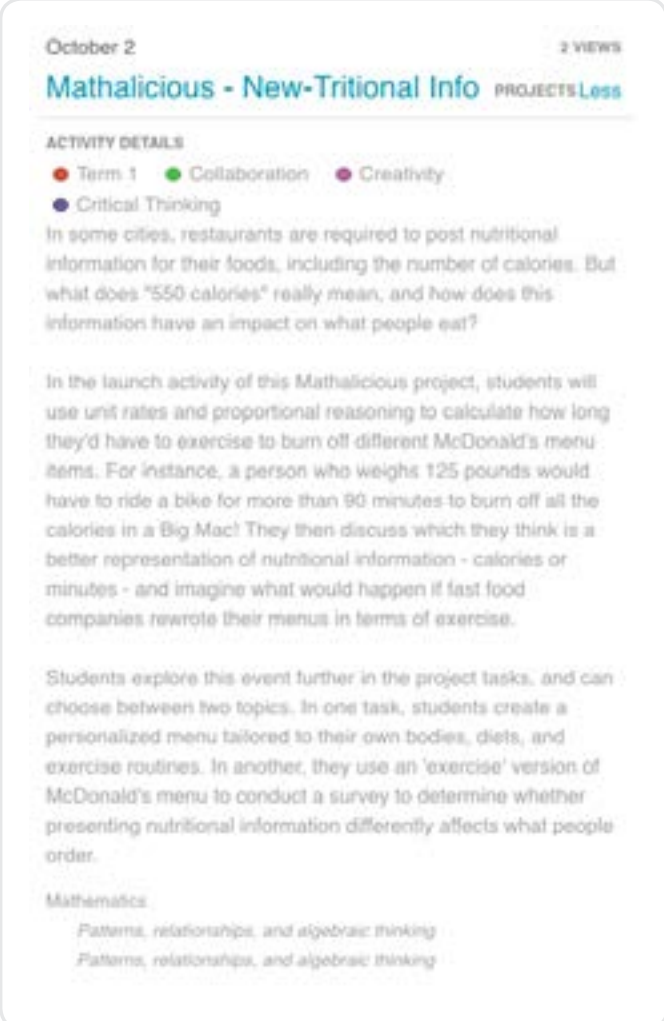
**5. DEVELOP** the summative product that addresses the challenge or problem students were tasked with solving and publicly share it.

Here is where we take theory and make it applicable to our daily life in the classroom. We encourage you to notice how the key features allow you to teach the project through the curriculum rather than as an enrichment piece added on after you teach your students. Your standards and learning outcomes, in one content area or multiple content areas, become central to the development and design of the final products. This is one of the more challenging aspects for teachers as they transition to a learner-centered classroom. Let's take a more detailed look at how each of the five features can support your move to PBL.

## IDENTIFY A UNIQUE CHALLENGE OR A PROBLEM TO BE SOLVED

Students begin by exploring a unique challenge that is authentic and relevant to the needs of the students (Laur & Ackers, 2017). Specifically, an authentic challenge is one that connects your curriculum to either a career or out into your school, local, state, national, or global community (Laur, 2013). This means while a challenge may be real-world in nature, it may not be relevant to your students. Your personal challenge may be to find the relevance for your students to connect your content with the world in which your students live. For example, we find many seventh-grade world history teachers try to have their students solve the Israeli-Palestinian conflict. While this is certainly a challenge and one that many diplomats have pondered over for decades, the relevance to most middle school children is lost. Instead, we ask teachers to consider having students solve a more local issue of conflict. They can then use the comparisons to global issues of conflict to take away lessons learned to apply to their given challenge. This local conflict might be an issue of race, immigrant discrimination, or even a case of religious intolerance.

To write the challenge for your PBL experience, you will need to generate an open-ended question that has the potential to have multiple answers. A challenge or question works best when it has the right



The screenshot shows a digital activity post from FreshGrade. At the top, it is dated 'October 2' and has '2 VIEWS'. The title is 'Mathalicious - New-Tritional Info' with a 'PROJECTS Less' indicator. Under 'ACTIVITY DETAILS', there are four tags: 'Term 1' (red), 'Collaboration' (green), 'Creativity' (purple), and 'Critical Thinking' (blue). The main text of the activity asks: 'In some cities, restaurants are required to post nutritional information for their foods, including the number of calories. But what does "550 calories" really mean, and how does this information have an impact on what people eat?' Below this, there are two paragraphs of descriptive text. The first paragraph explains that students will use unit rates and proportional reasoning to calculate how long they'd have to exercise to burn off different McDonald's menu items, using the example of a 125-pound person needing to ride a bike for more than 90 minutes to burn off all the calories in a Big Mac. The second paragraph states that students explore this event further in project tasks, choosing between two topics: creating a personalized menu or conducting a survey on how nutritional information affects ordering. At the bottom, the 'Mathematics' tag is listed with the sub-tag 'Patterns, relationships, and algebraic thinking'.

In this example, the teacher has posted an activity using an open-ended question to a student's FreshGrade portfolio. Notice that it has been tagged under "Patterns, relationships, and algebraic thinking," making it easy for the teacher to review during reporting season.

amount of content and the right amount of real-world connection embedded into it. We do not want to turn an objective or standard into a challenge. Years ago, a well-respected personal mentor once articulated, “Don’t write the challenge from the teacher happy place. Write the challenge in the kids’ space.” To illustrate this point, let’s take a look at this sample teacher question for a challenge: How will we identify, classify, and explore the environment to look for problems that need to be solved? Think about it for a minute. In this example, we just told our kids exactly what they will need to do each step of the way. The teacher in us says, “Yay! My kids will know exactly what they will have to achieve in this challenge.” However, the question or challenge should be written for the users of the challenge, not the teachers. Now, let’s look at the same question, rewritten, to see how to balance the content and the real-world authenticity of a question. Our question now becomes: How can we design safe spaces in our local community to combat biodiversity loss from population growth? As you read this, you might be in the middle of a slight anxiety attack as you think, “How will my kids ever answer this question? They don’t even know what biodiversity means!” We want to assure you that it is completely fine for your students to not know the answer to that part of the question at the start of the PBL experience. In fact, if they stare at you with blank looks for a few moments, then rest assured you have a well-developed challenge that is ambiguous. The ambiguity of the challenge leads your students to ask, “What does this question even mean?” The inquiry process starts with the very first question even if that question is, “Huh?” (Laur & Ackers, 2017).

The key is that the challenge answers cannot be Googled! Therefore, you would not want to write a question such as, “How do architects design buildings?” While we know there are many ways to answer this question, it does have a definitive answer. Instead, you would want to write an open-ended version of the question. Here are several possible variations that are dependent on your specific content (Laur, 2013 Laur & Ackers, 2017):

- How can I redesign the playground to better meet the needs of our students?
- How can I design a pool, seating area, and locker room for my school?
- How can we improve the school’s network and WiFi so all kids can stream video and content?

- What can we design and create that will sustain the ecosystem of the streams that surround our campus?
- A well-designed question leads to more questions. The exploration of these questions is the definition of what inquiry is when it is applied in the classroom. From here, students truly begin the process of investigation.

#### **INVESTIGATE THE CHALLENGE USING THE INQUIRY PROCESS AS STUDENTS LEARN AND APPLY IDEAS IN THE DISCIPLINE**

Your discipline or disciplines are what your students engage with to develop their ideas into solutions. Therefore, the use of your discipline's academic language, application of standards, and knowledge of content is imperative to the structural design of the authentic challenge. Yes, that sounds really academic, but this is where the challenge takes on a life of its own because it now belongs to the kids. Here is where we want our students to begin asking questions and lots of them!

The inquiry process is one that requires we take a step back and hold off on frontloading what students need to know. We anchor the PBL experience by giving them the opportunity to first grapple with the challenge. They then use their prior knowledge about the topic and communicate their initial predictions. It is also okay if they stare at you blankly for a while. We can let them struggle productively. A good entry into the challenge, such as a video or simulation, helps to spark their ideas. If your challenge is written as an open-ended question, there is no single correct answer, and it will leave students with a myriad of questions from the start. As your students dig deeper into the challenge and the content that supports it, they will develop subsequent questions that will further spark their curiosity as they seek new and innovative ways to solve the challenge.

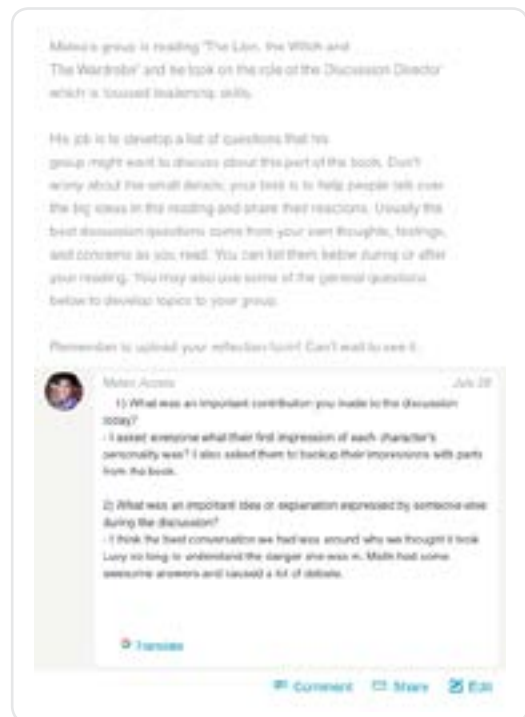
Let's go back to our biodiversity question: How can we design safe spaces in our local community to combat biodiversity loss from population growth? Hopefully, your anxiety has started to subside, and you are ready for the part where we let our students dig into the inquiry process. After you establish the challenge, let your students develop a list of questions so they can begin the research process. The questions they ask might include:

- What is biodiversity?
- What is loss?
- What is population growth?
- What does combat mean?
- What is being done about the situation now?

All of these questions prepare your students for the next steps in the PBL process.

#### EXPLORE THE CHALLENGE THROUGH COLLABORATIVE ACTIVITIES WITH STUDENTS, TEACHERS, AND THE COMMUNITY

Collaboration in PBL helps to develop a shared understanding, yet students typically abhor the idea of group work. You know how it goes one or two students end up doing the majority of the work. However, in PBL the use of groups and group work does not mean students share the load or split up tasks evenly to make sure everyone does their fair amount of the work. Group work in PBL means collaborative learning where learners cultivate, justify, argue, and recognize multiple perspectives on an issue to create the most appropriate and viable products. The PBL process entails individual and group dynamics to help the learner make meaning from the content and process to articulate that meaning. This happens from the onset of the experience and through each subsequent learning event. This becomes the basis for collaborative activities within the PBL experience.



Mateo self-reflects on the contribution he has made to his reading group. He discusses the most important conversation he had and praises a fellow student.

To encourage accountability, collaborative activities are placed deliberately at each learning event. When coupled with collaborative activities, individual reflection has a powerful impact on how a student takes ownership over their actions in a project. Group chemistry may or may not lead to a high functioning team. It takes intentionality on the part of the teacher to stimulate the types of experiences that create trust and team dynamics.

Team dynamics are impacted by size, personality, and experience. There is no magic number for the number of students on a team. One project may work best with partners and another as a group of four. We have also found that the magic combination of high-ability or low-ability groups is dependent upon you and your situation. We have discovered that the perfect balance of high, low, artistic, or techy does not always create the best team. We encourage you to think about your students' strengths and areas in which they want or need to develop as you create the teaming situation for your project.

The screenshot shows a digital learning interface. At the top, it says "August 22" and "Added by: Mateo Acosta" with "1 VIEWS" in the top right. Below this is a portrait of Harriet Tubman. Underneath the portrait is a post by Mateo Acosta dated August 22, which reads: "The Underground Railroad has a lot of interesting characters in it, and the abolitionists I'm finding inspiring. The whole movement was full of danger and strong people, but in particular I liked learning about Harriet Tubman." Below the post is a comment by Nancy Brown dated August 22, which asks: "Harriet was a supporter of the underground railroad, but did all other abolitionists support it? Why do you choose to highlight Harriet, Mateo?" At the bottom right of the comment section are icons for "Comment", "Share", and "Edit".

In this example, Mateo's teacher asks probing questions to help Mateo clarify his thinking process.

#### UTILIZE THE INQUIRY PROCESS TO REFINE PRODUCTS BASED ON PEER, SUBJECT MATTER EXPERTS, AND TEACHER FEEDBACK

The inquiry process reflects the complex social situations that experts go through while solving problems and innovating new products. It is the main through line for any well-thought-out PBL project. As students develop their products, the continuous refinement process is what elicits higher quality work



from them. The refinements students complete are based on feedback from their peers, the experts with whom you partner, and your guidance. Therefore, the same deliberations need to be taken when training your students to provide feedback.

A feedback loop is the ignition switch for getting students to think critically and ask questions about their projects and their peers' work. However, critical thinking can be a challenge to make tangible and visible for both the students and the project. Students and adults need training to develop their feedback skills to ensure the feedback they provide is growth producing and meaningful. In the absence of any formal feedback training, it is challenging for students and even adults to think of feedback much less craft thoughtful questions to pose to their peers. We have to help our students realize that feedback is more than just telling a peer what they like or don't like about their work. It is more helpful to provide feedback to students that include questions to ponder as they refine their work.

Students demonstrate their understanding of the content through the artifacts they develop. Refinement and improvement of the products and artifacts happen iteratively through formative assessments, reflections, and feedback. Each artifact and change reflect the students' emerging understandings of the content and their developing skills. This iterative progression is ongoing and fueled by the inquiry process that relies on these continual investigations, reflections, and feedback.

Our role, as teachers, is to provide the opportunities for students to learn and practice the art of discourse and debate through collaboration. This is how students learn to give growth-producing feedback as they talk about what they see as strengths, what they see as areas of growth, and provide ideas or suggestions for improvement.

This holds true not only for our students but for any subject matter experts we engage as part of the feedback loop. Therefore, they may need guidance, as well. In short, we must remember that feedback is only as good as the words used to provide it. Teachers, students, and subject matter experts alike must choose their words carefully to convey their meaning and add value to the process of refinement that is such an integral part of the PBL experience. Now, the feedback we receive ends in a much higher quality summative product that becomes a celebration of learning rather than an "I gotcha" moment.

## DEVELOP SUMMATIVE PRODUCTS THAT ADDRESS THE CHALLENGE OR PROBLEM STUDENTS WERE TASKED WITH SOLVING AND PUBLICLY SHARING

The premise of PBL is to solve real-world challenges through questions, investigations, analyses, drawing conclusions, and finally the presentation of findings to an authentic audience. Modeling, coaching, and scaffolding combined throughout a project help our students acquire the content and skills needed to reflect on and articulate their final solutions. We know final solutions are far more effective when the audience is made up of experts, as students are genuinely concerned about the potential impact of the presentation and changes that they may achieve as a result rather than a grade they receive (Laur, 2013). This is why we also suggest experts are rotated throughout the project, so the final product is a representation of the circular feedback loop that is so important.

Learning is not linear. This means students can take three steps forward and two steps back within the same class period. To apply and synthesize new and complex content takes time. Thus, there is no magical time frame for completing a project. We get asked all the time: How long should a project be for (insert grade level)? There is no timeframe for a project because it depends on the authenticity of the project, the type of product(s) needed to address the challenge, and the content and standards addressed in the project. We do recommend that you think about what is developmentally appropriate for your learners. What depth of learning are you looking for from your students? What is relevant in your community or in your school that interests your students or is connected to them? These are all questions we begin to ponder as we start to ideate a project.

Now that you know what PBL is and why is it a critical pedagogy to consider, you are probably asking yourself, "What do I need to do to get started?" As you begin to think about your next steps and about how to create an effective PBL experience, remember that the project design process is open-ended and student-driven and the final products have many possible solutions. The same holds true for us as teachers. As we design a project it will be an open-ended and ambiguous process. To get started, take a look at your content. Identify a place in your curriculum, year-at-a-glance, or pacing guide and target an area or unit that is easily adapted or modified. Start with units that you are passionate about and find your successes in PBL early and as often as you can. A personal challenge might be to take on one of the units that prove less than exciting for you to teach. You may end up surprised at the shift from feeling frustrated to finding relevance and meaning by looking at the work from a new perspective. As you stay current on what is happening in your local community and global news, you will find they also provide a wealth of ideas for authentic and relevant projects.

## Level Two

### HOW DO I TAKE MY PBL PRACTICE TO THE NEXT LEVEL?

The PBL pedagogy mirrors that of an apprenticeship. As you move from novice to intermediate, and eventually to advanced, you will experience trials and tribulations along the way. From these, you will grow as a learner and practitioner, all while making the necessary adjustments to meet the needs of all of your students. We encourage you, no matter on what level of the PBL spectrum of implementation you place yourself, to reflect on what worked and why, as well as what hiccups occurred throughout the project. From these reflections, set goals for your next project.

For a novice PBL teacher, a reflection upon their first experiences might be related to formative assessments. When you are in the throes of your first project or two, it is easy to forget the checks that are necessary to ensure every student is on target with building the skills and content that are your course requirements as part of your curriculum. Or, in some cases, formative assessments occur but the information gleaned from these assessments is not utilized to shift the instruction to meet the needs of your learners. The goals that a novice teacher might set for their next project could include the use of a variety of formative assessments that are clearly documented with a plan to meet each student's needs.

To move out of the space of novice PBL teacher, an intermediate PBL teacher will shift their focus. After implementing roughly five projects, and the implementation of a particular project more than once, an intermediate level PBL teacher will likely start to focus on the lack of scaffolding or too much scaffolding for the students. In our experience, in the beginning, PBL teachers are so focused on the project as a whole that they sometimes forget about the day-to-day lessons and activities that are necessary to support each student in being successful in the project. After the first project or two, with perhaps a bit of mild chaos, a shift tends to occur. From here, we generally see an overly prepared approach with scripted lessons that take away from the inquiry process that is the backbone of the PBL pedagogy. Thus, a good goal for an intermediate teacher might be the development of a tentative calendar of lessons and activities from which to choose as the project progresses.

There is no specific timeline to get you from novice to intermediate to advanced in your PBL practice. It is dependent on your comfort level of when and how to implement the projects. You may start with one project per year or one per semester. If you teach multiple classes, you may decide to focus on one

before moving to the other. One thing is certain, however, the more frequently you implement projects, you will notice your own growth as you reflect on and revise those projects. This is especially true after you have implemented a particular project more than once.

An advanced PBL teacher is ready to make a move into design collaboration with other teachers. These may come in the form of an interdisciplinary project within your building, a cross-grade level experience that perhaps branches into a different building within your district, or, if you are ready, a global extension of the work you originally envisioned.

Interdisciplinary projects happen when two or more teachers from separate disciplines work together and share a common challenge. These cross-curricular projects support meaningful associations between content, which supports contextualized understanding of two or more content areas.



Using FreshGrade, teachers can invite other teachers to view their class. This visibility can provide insight and much needed support to teachers.

If you are intimidated by developing a project with a teaching partner, you can start with bringing other content areas into your own. Often this is easily done at the early elementary level when all subjects are self-contained in the classroom. At the secondary level, it may be as simple as having your students in a social studies class analyze given data through charts and graphs for an added math component. Similarly, a science class might develop a written proposal that incorporates persuasive writing that is typically reserved for an ELA class. The more advanced you become in your PBL approach, the more comfortable you will become branching out into other disciplines. Eventually, you

will be prepared to make the leap into bringing another teacher or even several teachers on-board with your project.

To have a deep knowledge of several content areas provides the opportunity for students to build a well-rounded skill set. We know that in the world outside of the classroom, subject areas are not neatly separated into 50-minute blocks of time. Every day, in every other facet of life, our kids are bombarded with a variety of stimulating events that encompass math, science, reading, writing, civics, art, and sports. To meet the demands of the real world, we must be ready to develop PBL experiences that also expand into these areas, even as it stretches our own comfort levels.

In the beginning, as a novice PBL teacher, we suggest starting a project on your own to gain your initial experience. When you are ready, move into what is known as a cross-curricular or interdisciplinary project. Cross-curricular projects incorporate team dynamics, content and discipline dynamics, and assessment dynamics. To develop each of these areas, start by looking for the associations that exist between the desired content areas. However, it is important to not force the areas of association. If you choose only a nominal connection, your students will have a difficult time making the linkage. Once you determine the strong ties between the two content areas, you must decide if the work will be shared evenly or if the work will be anchored in one class and supported through the other. When you have arrived at these conclusions, the coordination of implementation begins.

An interdisciplinary project has many moving parts. The logistics and scheduling of cross-curricular projects have to be worked through as you decide which classes will be responsible for the development of each product. You must consider how formative assessment will be shared and how each class will provide the other with feedback, as well as updates on progress that have been made. If your classes meet at different times during the day or are located in different time zones, you have an extra hurdle to master. In these situations, technology is your best friend, as your students share their work, engage in online discussions, and can collaborate in real-time creation via a variety of tools.

Global connections in PBL are an excellent way to expand the boundaries of your classroom. The opportunity to partner with another classroom and co-create projects are endless. We see teachers collaborate on projects from state-to-state, country-to-country, and in some instances as many three or teachers in various countries. According to author and global education expert, Jennifer D. Klein,

“Once you find your partner teacher, you can have a conversation about where your curricular priorities intersect.” With these global conversations, we have seen a rise in teachers use of technology to co-create projects across the world. There are almost endless aspects to the blend of tools that offer teachers and students spaces for collaboration and exchanges. Students around the globe now have the ability to provide each other with feedback, exchange ideas, and share challenges.

One such example project is the development of a global digital makerspace lab that was created by Zach Mbasu’s STEM high school math class in Africa. The challenge came to life when his makerspace began to address global problems. The students initially started out by looking for challenges within their own community. They then turned to making products to solve these issues. Their ideas began to grow and expand, as they were able to use science, technology, engineering, and math to solve challenges. After they found success in their communities, they wanted to expand their reach. Next, they began to look for global partners. They used technology to investigate potential international partnerships using their digital, collaborative makerspace. They found partner classrooms through social media and made connections around the world. These connections turned into student-led conversations where they discovered they had the same or similar challenges. Currently, the project has active digitally connected makerspaces between classrooms in Africa, Finland, and the United States. It is a STEM project gone global.

Another great way to move your PBL experience into more of an advanced approach involves tapping into subject matter experts for a deeper level of feedback for your students. We suggest you also consider having them help co-create the PBL challenge with you and your students. In fact, a simple conversation with a subject matter expert is a good starting point for planning a PBL experience. It might spark your own ideas on how your content connects to the industry and the specific terminology that is used on a daily basis by the professionals themselves. As professionals, they offer us a window into the work that they do on a daily basis.

#### **HOW TO MAXIMIZE YOUR GLOBAL CONTACTS**

At this point, you might be wondering how to expand your network of subject matter experts. When teachers begin to incorporate PBL into their classroom they rely on their personal networks, such as school staff and faculty and friends to be their subject matter experts. They quickly exhaust their networks and some have even resorted to having others pretend to be a certain kind of expert because they could not find one. We do not recommend this pretend route, as students often do not take the

project as seriously. Some districts are fortunate enough to have onsite career coordinators who can make the connections for you. However, if you do not, you have to consider other ways in which to make a connection to these experts. In some cases, cold calls to businesses and organizations work. Social media is another way to make connections. You can also consider working with an outside organization to make the contact with businesses. This could be as simple as your local Chamber of Commerce or as in-depth as an organization such as Project ARC or Real-World Scholars that facilitates these connections. We teach in think tanks every day where amazing projects continually connect teachers and learners to real problems and industry experts to kids, as we maximize our capacity to collaborate regardless of the boundaries. Through this, we foster creativity and critical thinking in our environment as we prepare our students to be college and career ready.

As you and your students become more adept at the project approach, another option is to invite your learners into the planning process. As the teacher, you have the opportunity to co-construct projects with your students. This process can take shape in many ways but the one thing we know for sure, based on our own experience, is that students love the chance to be part of the design process. Start with letting your students examine the learning outcomes and look for real-world challenges that might possibly connect to those outcomes. They may surprise you and make connections you haven't yet discovered. From here, have your students break down the learning outcomes to begin their preliminary descent into content. They will initially seek cursory meaning of the chosen content to be able to locate the authentic challenges within it. This process can be done as a whole class in which they create a set of potential challenges. At this point, students can either vote on a class topic or self-select topics of interest for individual pursuit. Another approach is to place your students in smaller groups from which they select a topic for greater autonomy in a smaller setting. As you begin to implement small changes such as these, they have a larger impact on the community you build within your classroom.

#### **COMMUNITY OF PRACTICE**

By integrating PBL in your classroom, you consciously or unconsciously begin to foster a community of practice. A community of practice is a group of people that trust each other enough to give growth producing and honest feedback. It does not mean everyone has to be friends, but it does mean that the culture is based on certain norms that create a safe space for everyone to communicate. A classroom culture thrives on this type of community because students feel emotionally safe to express and share their thinking. The three significant types of communication that are needed not only to create trusting community within the classroom but also to measure student learning in PBL are self-assessment,

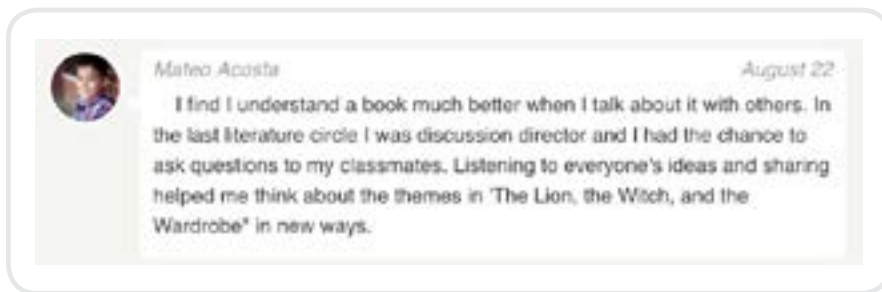
peer-assessment, and metacognition. All three types of communication have distinct strategies and techniques that scaffold and support the communication process so students can interpret not only the reasoning and thinking of others but also of themselves. The ability to interpret and reason through challenges in a team requires intention and attention from the teacher. Students typically do not come into the classroom equipped with these types of communication skills. Therefore, we need to incorporate team building, protocols, and feedback loops into our daily classroom routines. These routines, to name a few, might include reciprocal teaching, the feedback carousel, pyramid teaching, or text clue conclusion groups (Laur & Ackers, 2017). Strategies such as these help to foster the communication that is necessary for students to successfully collaborate within their community of practice. Additionally, they help students to reflect on themselves as learners. As they make changes to their initial ideas, prototypes, or first drafts in a true form of self-assessment, students have actually communicated with themselves the process of their learning.

For students, it may sound odd to think of a communication strategy that deals with themselves but self-assessment can help a learner make independent judgments about their own understanding of content-specific learning outcomes or about the challenge itself. Self-assessment encourages students to get involved in their own learning. It allows them to reflect on their judgments and justify their thinking. It is also a tool that permits them to reflect on their actions as a team member by identifying areas of strength and growth. Students may have little experience with self-assessment, so it is important to take the time to introduce them to it and discuss the reasons behind the advantages it provides for them. It helps them to see how the assessment moves them from quality work to high-quality work. Here, you may also want to introduce the idea of co-constructing a rubric. This allows your community of students to collectively define the qualities of an effective communicator.

The same idea of quality work holds true for self-assessment. The reciprocity of feedback creates conditions for learners that encourage new ideas and helps students become aware of how to use feedback from peers. The cause and effect results of structured peer-to-peer feedback can positively impact how a student connects content, standards, and skills to make improvements to their existing work. Therefore, it is our role to provide this structure which enables the feedback to happen in a safe and meaningful way. Our feedback activity choices depend upon the kind of feedback you want your students to give to each other at that time. This means you design the feedback to either be about content and standards, team collaboration skills, or a combination of both. In our classrooms, we have the flexibility to utilize design structured feedback opportunities in many ways. This flexibility can be enhanced by the use of technology to provide these opportunities. Surveys, rubrics, online reflection



tools, and protocols are all possibilities. For example, a tool as simple as a t-chart provides detailed reflection information. The column on the left side of the t-chart says, "I said" and the column on the right side says, "I meant." With this, you can practice with your students by asking them to give you examples of feedback they have given or received in the past. You then use these examples to model for your kids how to change simple feedback from "I said" to a more growth-producing statement using "I meant." We have also found through roleplays and providing examples of how to do this from the onset helps your students practice these skills. The frequent use of appropriate self and peer-to-peer assessment strategies also provide you with valuable data. Based on the information collected, you can continuously make adjustments to instruction and differentiate for groups and individuals. This process will also help students to begin to learn how to effectively think about how they learn.



This is a great example of Mateo demonstrating self-awareness about his own learning.

Metacognition is the ability to learn how you learn. It is a powerful tool that helps us improve learning outcomes for all students. The ability to improve our own learning increases when we are more aware of how we learn. We start to regulate the learning and subsequently, we begin to learn deeper, better, and faster. This impacts learning because we can assess ourselves in multiple areas, which can lead to better study skills, decision-making abilities, and revision habits. Metacognitive strategies can be utilized from the very beginning of a PBL project to the very end. These strategies for metacognition include asking your students what tactics they use to solve problems, having students share the ways in which they solve problems and the creation of a classroom "bank" of problem-solving ideas. These strategies, however, can be as simple as you modeling your thinking by explicitly telling your students what you're thinking to simply providing them with a visualization of your thoughts. As we close out the ways in which you can move toward becoming an advanced PBL practitioner, we hope you have visualized goals toward which you wish to work. Now is the perfect time for you to reflect on your own learning, as you, too, become metacognitive about your understanding of PBL.

- Where are you with your own understanding of PBL?
- What experiences in your own life can you relate to PBL?
- What current classroom practices do you have in place that will support you as you move toward a more PBL-friendly environment?
- What do you need to investigate further to become a PBL expert in your classroom?

# Conclusion

By now, we hope you realize PBL is not a complicated pedagogy. Instead, PBL is really the added depth and complexity of your classroom in a truly authentic and relevant approach to learning for your students. Through the implementation of PBL, your students have the opportunity to participate in real-world challenges that give them the space to become creators of new information rather than merely passive consumers of that of which is already known. In fact, authentic learning begins by coupling your discipline with real-world challenges. Once a challenge is identified, a linkage of the two with the inquiry process provides the conditions necessary to make meaning and construct knowledge based on your content and the challenge. By allowing industry experts to be a part of the process, we open the door to career exploration, workplace issues, and provide students with the opportunity to experience real-world work conditions and what world has to offer.

In a true PBL environment, your students are empowered by and engaged in the learning process as they move beyond simulated and contrived activities. At the same time, you avoid the trap of creating another lesson plan. Rather, meaning and purpose connect every facet of the classroom as students and teachers, alike, work toward a common, innovative end-goal. The future of project-based learning is in the hands of our teachers as they expand their own knowledge base to develop and shape shift classrooms. Today, the capacity to adapt to change has morphed into the ability to anticipate change. The future needs those who can think critically to anticipate challenges and respond. It means our students will be placed into opportunities where it will be necessary for them to look at problems

before they occur. We are excited for the future of education and the promise that PBL holds for all of our students. As more teachers, schools, and districts adopt PBL as a preferred pedagogy, students everywhere will have the opportunity to engage in meaningful challenges as they develop solutions that have the potential to effect change. The innovation and creativity they possess through their inherent natural curiosity is desperately waiting to be unleashed. The time is ripe for our schools to become the hotbeds of innovation as they have the potential to work together with higher education and industry. Now, more than ever, in a society of rapidly changing global and technological advances, it is imperative that our students are prepared to anticipate and meet the challenges they will face when they leave our charge. What will the future hold for all of our kids? With a combined three and a half decades of PBL experience, both nationally and internationally, we truly believe PBL is the best answer to the needed preparation of our students to develop their own pathways of innovation.

Now, the key is for you to take action! Go ahead and get started on planning your project. Remember that not having all the answers is part of the process and asking for help from others is exactly what we would want our students to do. Look for online resources and blogs that serve as resources for you as you get started with ideas and you begin to incorporate PBL into your classroom. It is so important to have your own community of practice that we recommend you find a thought partner or partners to share and reflect on the work you are doing. In time, you, too, will grow as you add to your direct experiences in the classroom, read additional books on PBL, and participate in the expansion of your own personal learning PBL network. To get you started, here are a few resources we recommend you review:

#### **A YEAR AT MISSION HILL**

This year-long video series focuses on one of America's most successful public schools. Take a look at the behind the scenes work that goes into creating an authentic PBL experience for students. We particularly like Chapter 8: The World of Work.

#### **AUTHENTIC LEARNING EXPERIENCES: A REAL-WORLD APPROACH TO PBL (2013)**

Dayna's first book provides a rich overview of how to implement PBL from an authentic, rather than a simulated perspective. All grade levels and content areas are included as examples with direct connections to the standards listed.

#### **DEVELOPING NATURAL CURIOSITY THROUGH PBL: 5 STRATEGIES FOR THE PRE-K3 CLASSROOM (2017).**

This is the first in our four-book series that will extend into higher education. In it, we outline the Five Stages to Developing a Solution to support our students as they engage in authentic challenges. Detailed examples of scaffolding, formative assessments, daily routines and schedules, as well as a plethora of specific project examples are integrated throughout the book.

#### **EDUTOPIA**

Funded by the George Lucas Foundation, Edutopia shares videos, blogs, and tips for K12 teachers on how to improve PBL practices and similar pedagogies that support the implementation of PBL.

#### **GETTING SMART**

It's a Project-Based World is a series of blog posts is dedicated to the exploration of how PBL, through the lens of equity, can make students college, career, and citizenship ready. Podcast interviews and infographics are interwoven throughout the series.

#### **PARTNERSHIP FOR 21ST CENTURY LEARNING (P21)**

Review the Framework for 21st Century Learning to help your students better learn how to communicate, collaborate, think critically, and create. These four essential skills are foundational for PBL implementation.

#### **PROJECT ARC**

This consulting group matches your teachers' curriculum with business partners to develop authentic PBL experiences and can help to develop the projects you wish to implement.

#### **REAL WORLD SCHOLARS**

This e-commerce platform allows students to run a business right from the classroom. Real World Scholars provides teachers with a ready-made resource to build entrepreneurship into their existing curriculums.

#### SO ALL CAN LEARN: A PRACTICAL GUIDE TO DIFFERENTIATION (2017)

John McCarthy explores a variety of tools to support your implementation of the PBL process. His references create an immediate plan for application as you design lessons to support each student as they work toward solving the challenges with which they have been tasked.

#### TEACHING TECHNIQUES: PROJECT-BASED LEARNING FROM LYNDIA.COM

Explore the foundations of PBL with Dayna. Tips for how to write the project challenge, find the right audience, scaffold, assess, and more are included in this video series.

#### TWITTER CHATS

If you aren't already a member of Twitter, it is never too late to join. The conversations are rich and rewarding as you build your network of PBL enthusiasts. Feel free to connect with us on Twitter: @ibpbjill and @daylynn

Several chats that we enjoy occur on a weekly basis:

- #pblchat Tuesday 9:00 PM Eastern
- #dtk12chat Wednesday 9:00 PM Eastern
- #gloaledchat Thursday 8:00 PM Eastern

These resources are additional entry points for your further exploration of project-based learning. We encourage you to go beyond those that we have listed. Just as your students will engage in the inquiry process as they immerse themselves in a project, you, too, will find each resource leads you to another. You will continue to develop new questions that you seek to answer during your personal PBL journey. We are confident that the outcome will be a rewarding one for you and your students.

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# About FreshGrade

FreshGrade is a learning portfolio platform that promotes student ownership and parent engagement. It allows teachers and students to quickly capture evidence of learning, provide feedback and track progression of national and state standards as well as custom district objectives. The suite of mobile and browser-based applications specifically designed for Pre-K-12 *makes learning visible* and *immediate*. Students, teachers, and parents develop a deeper understanding of their achievement and progress with a portfolio that documents the process, not just the product, of learning.

“FreshGrade forms a continuous glimpse into each child's progress that parents and students can share.”

— SIR KEN ROBINSON, AUTHOR, CREATIVE SCHOOLS.

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