TeachME PROFESSIONAL DEVELOPMENT
CEUs for Teachers and Educators

Project-Based Learning

Introduction

Project-Based Learning is a relatively new trend in academics that seems to be gaining in popularity—for many reasons. In a classroom that models Project-Based Learning, students are invited and enabled to investigate on their own as they explore and respond to open-ended, question-based learning prompts. In this way, they will enjoy a unique and creative approach to education that can be eye-opening for students and educators alike.

Benefits of this approach include nurturing more thoughtful and reflective students who will likely improve their creativity and self-confidence. In addition, since a great deal of time will be spent on self-monitored, self-directed projects, teachers may be able to use their time more productively to mentor their students. Additionally, since Project-Based Learning is a collaborative experience, by partnering with other students on projects, students can also learn teamwork and communication skills that will serve them well for their entire lives.

Section 1: What Is Project-Based Learning?

In this course, we'll discuss the latest research underlying Project-Based Learning (PBL), and we'll discuss specific ways to implement these strategies in the final section. Characteristics, advantages, and essential elements of PBL are discussed below.

What is PBL, and what are some of its basic components and characteristics?

In short, Project-Based Learning is a type of approach that puts the student in the driver's seat. With PBL, students have the opportunity to develop their skills and knowledge bases through relatively independent, free-flowing projects or problems that are focused on real-world scenarios. Whether students tackle projects as teams or as individuals, PBL tends to result in a real sense of independence and satisfaction for students — and it can even be less burdensome for teachers, as well (Larmer, 2020).

However, that doesn't mean that this is a low-effort endeavor. Teachers will have to be very mindful about the way they mentor students in a PBL scenario, and connecting students to the resources they need in order to be successful is no small task. It's also important to be very clear about the fact that PBL is more involved and deliberate than

simply having your students do class projects after class projects. As the experts at the Buck Institute for Education have noted, with PBL, it's key that students feel they are able to "investigate and respond to an authentic, engaging, and complex problem or challenge" with their whole attention (Larmer, 2020).

Why PBL? Why bother with this level of academic focus and class projects?

PBL is relatively new on the educational scene. There are those who believe that the emergence of project-based learning could help prepare students for life in the actual workforce, where adults tend to take on a series of projects as they go about their working weeks. PBL helps teach students from their early years to be creative, critical thinkers that rise to the challenges ahead of them in their day-to-day lives (Larmer, 2020).

As it turns out, PBL also appeals to the minds of our young ones. Children are eminently practical people, and directing their own investigation appeals to them. So does rooting potentially more theoretical concepts in real-world applications. For example, studying geometric proofs can be an abstract, painful, and overwhelming task for many students. Figuring out how to create their very own puzzle with tessellation (or another fun, colorful, and tactile version of studying how shapes interact with each other) can cover the same or similar concepts in a much more memorable and engaging way (Larmer, 2020).

What are the essential elements of Project-Based Learning?

At its core, PBL sounds simple enough: Have your students take on projects related to their field of study. Make sure that your students are connected to the resources they need to feel creative. And, of course, tie your students' projects into real-world applications as much as is possible (Larmer, 2020).

While that may communicate a good portion of PBL's intent, it's far from an all-encompassing rundown of what PBL requires. We can more helpfully define PBL through the following seven essential elements (Larmer, 2020):

- **Open-ended questions.** Each project that a student takes on should feature or focus on a big question that will prompt student curiosity. Part of the project

should entail student research regarding the central question, as well as some type of documented or presented student response to the central question.

- **Building on a strong academic foundation.** Each project that students tackle should be something that they are prepared for based on their previous academic histories. When selecting projects, students should work closely with their teachers to ensure that they select appropriate projects that are accessible yet stimulating. While projects should be challenging, students should never be overloaded with a project that is so difficult that it causes them to shut down because they are so stressed.

- **A process of generating more questions even as students work to find answers.** When new questions arise, the project will feel simultaneously more true to real-life experiences and more like a scavenger hunt. This will help stimulate students' curiosity and help them develop their powers of focus and logical inquiry.

- **A strong focus on 21st-century skills.** PBL encourages skills that will help students succeed in an increasingly technological and ever-changing world, where teleworking may become even more of a norm — such as collaboration, communication, creativity, and critical thinking.

- **A strong focus on student choice.** While a good amount of teacher mentorship will be required to ensure students choose appropriate projects and have the resources they need, students need to feel free to make their own choices to reap the benefits of having ownership over their projects.

- **A true-to-life emphasis on feedback and revision.** In our daily adult lives and in our careers, we rarely find that submitting a piece of work once is the end of the process. This is very different from traditional homework and test opportunities, where, in school, students often have one chance to score as high as possible with no chance to increase the quality of their work. While students will still likely have to take exams in a PBL learning environment, it may be a good idea to shift some of their other work to more of a give-and-take type of learning structure where they are able to make improvements and revisions.

- **A true-to-life emphasis on asking students to present their work.** Again, in our adult careers, we are often asked to give at least a brief overview of what we have accomplished. While this should be done carefully so as not to give vulnerable children anxiety, it's important to help children gain the skills they need to give succinct, helpful, and confident presentations about their efforts, research, and

conclusions. Also, crucially, it's key to give these students the experience of peer review and constructive feedback. These necessary steps are ubiquitous in the adult workplace, yet many adults are unfamiliar or uncomfortable with the process. Helping students know from a young age that peer review and constructive feedback are necessary and beneficial can help introduce them to true-life experiences.

Following a comprehensive review of pertinent literature surrounding PBL and surveys of those who have specific expertise and experience in the area, one educational institute identified seven elements deemed essential for PBL. Helpfully, these focus less on the needed takeaways from PBL (which are more the focus of the elements outlined above) and, instead, outline the ways teachers should consider designing the projects that they help students tackle (PowerSchool, 2021).

According to these experts, the seven must-include elements of a PBL project are (PowerSchool, 2021).:

- A challenging question or a problem to drive the project
- Inquiry that is sustained throughout the project (e.g., the answer to one question prompts another)
- Authenticity (e.g. the problem feels true to life or relevant for the student)
- Student choice and voice in the matter (e.g., the student should have some level of say over the subject matter and direction of the project)
- Reflection (e.g., the student should stop throughout the project to consider how it's going and its implications)
- Critique and revision
- Public product or presentation

One school district in Illinois created a class around the PBL structure that provides an illustrative example. In this high school business class, the teachers formed teams of students to work collaboratively. The students took time to design and pitch a product that was based on a real-life problem that they faced. (The idea was to create a "Shark Tank" feel for kids, which helped both teachers and students get more excited about the concept.) The teachers helped the students create budgets, gather materials, market their ideas, and even partner with local entrepreneurs and business leaders for

mentoring. The class was a monumental success, with teams of students designing mobile apps, practical products, and some experimental innovations that may not have done well in the real-world marketplace, but certainly helped those students realize the value of creativity (PowerSchool, 2021).

This example can also serve as a reminder that PBL doesn't have to be isolating. Rather, the focus should be on giving students a worthwhile and inspiring educational experience with tangible value, whether they work with or apart from their peers (PowerSchool, 2021).

While this type of teaching philosophy doesn't necessarily require less effort (and, in some cases, can even require more effort from teachers - particularly in the early project onboarding phases), it is associated with myriad pay offs that, to many, make the higher expenditure of time worth it for all concerned. In the next section, we'll discuss these benefits briefly in order to ensure that we are providing an accurate picture of the reasons to pursue PBL (PowerSchool, 2021).

What are the benefits of Project-Based Learning?

One of the primary benefits of project-based learning is simply stated: It helps school-taught lessons transcend simply-academic criteria. In other words, through project-based learning, a student will learn more than particular subject matter. They'll learn time management as they track projects, as well as presentation skills, organizational skills, communication skills and more as they move through a largely self-guided project (PowerSchool, 2021).

In this way, project-based learning helps connect students to the concept of learning beyond their classrooms. In theory, at least - and, quite often, in actual research, as we'll discuss in a later section - students who have some project-based learning experience will be better prepared to meet the challenges life presents in a more balanced manner (PowerSchool, 2021).

Specific benefits of project-based learning are as follows (PowerSchool, 2021):

1. **Project-based learning allows students to engage deeply with their content in a practical and ultra-memorable way.** This allows students to sidestep cumbersome, routine, and inherently less valuable practices like learning the same content less effectively through flashcards and rote memorization. Rather,

by practically using the information to attain an end, a student will engage with the content in a way that promotes deeper learning instead of regurgitation.

2. **Project-based learning contains inherent motivation.** Students are practical, and by nature very curious. Many students are also high-achieving and competitive. The idea of solving a problem they are given or making a valuable product (or something else with a tactile or public end in sight) will attract many students. Even students who would prefer not to be in the spotlight would likely prefer some type of hands-on, inquiry-based creative work over lectures and reading. Because project-based learning is more engaging and more fun, students want to learn more - which makes teaching much more effective and far easier in the long run.

Backing up this philosophy is productivity expert Daniel Pink, who created a popular TEDTalk that highlighted how people are motivated by purpose, mastery, and autonomy. Project-Based Learning allows students to start with autonomy and purpose and see results as they work toward mastery, making PBL a very compelling experience for both students and teachers alike (PowerSchool, 2021). Additional benefits of PBL include (PowerSchool, 2021):

1. **Project-based learning is correlated with higher levels of student achievement.** Intriguingly, researchers from Michigan State University and the University of Michigan found that this benefit is seen in disproportionately high levels and among schools that struggle with poverty. As poverty is associated with lower levels of engagement and achievement, the positive impact that PBL may be able to provide in the students' favor will likely be particularly valuable.

2. **Project-based learning is focused on meaningful business and communication skills.** When undertaking a project, students will learn about more than just the academic content at hand: They'll learn teamwork, critical thinking, and problem-solving skills, which are critical for the workplace and beyond.

3. **Project-based learning can go hand in hand with Social and Emotional Learning (SEL) endeavors.** SEL is extremely important for the healthy development and success of a young student. The partnership building, communication, and collaboration inherent in a PBL framework help reinforce SEL learning in an organic and productive way.

4. **Project-based learning can inspire real interest in a field of study.** When subjects are brought to life with real tasks and meaningful projects, students can have a

much better sense of what becoming, for example, a mathematician, scientist, or artist could really be like. Not only can this deter students from picking a career or course of study that might not actually, in reality, align with their personality and preferences, but it can also help connect previously-uninterested students with the career of their dreams.

Project-based learning is far from a perfect, stress-free, or easy-to-implement framework. As with other learning and teaching modalities, along with the numerous benefits that PBL offers to the academic community, challenges may also arise in its implementation. Such challenges will be discussed in the following section.

What are the challenges of Project-Based Learning?

The challenges of Project-Based Learning, simply stated, are as follows (PowerSchool, 2021):

1. **Project-based learning can be a steep departure from what many people are used to when they think of education.** While innovation can be positive, it may al so be difficult for people to embrace. When PBL teachers or schools begin a school year with less instruction, more coaching, more interdisciplinary learning, and more community engagement than is perceived as the norm, that can ruffle some feathers.
2. **Project-based learning is relatively new in the educational scene.** Many of the support systems that we have in place as a society are geared for more traditional types of instruction. This can make finding support for it as a teacher just starting out relatively difficult.
3. **Project-based learning can seem scary and overwhelming in the beginning phases.** For a young student just starting out on their educational path, being told that they will be responsible for a massive project throughout the schoolseme ster can be concerning. For these students, it might be a good idea toemphasiz e the fact that (just as in life after school) the best way to tackle a massive proje ct is to break it down into tiny, extremely manageable steps.

What are some examples of Project-Based Learning?

Before we delve into the research surrounding PBL as well as practical tips for implementation in later sections, it may make sense to provide some specific examples of PBL to give some context to our following conversation (PowerSchool, 2021).

- One science teacher decided to begin a PBL module with a field trip to the zoo. This naturally piqued student interest and enthusiasm, so the project was already beginning at a high point. In the lead-up to the zoo adventure, the teacher presented the students with information about animal habitats and encouraged the students to form opinions about the best environment for a particular animal. Then, after the visit to the zoo (which gave significant practical relevance to the previously-amorphous conversation), the teacher asked each of the students to build a plan for a new type of habitat for the animal of their choice. The students had to back up their planned environment with research and drawings, and then present their findings to zoology students from a nearby college, where they were able to receive feedback.

- While, from this example, it may seem very clear that PBL is well-suited to the sciences, it can be natural to find ways to incorporate other aims as well. For example, one English language arts teacher decided to team up with one of her colleagues, a social studies teacher. In their blended PBL module, they asked their students to define the role that censorship plays in society. In order to do this, they had their students find a book that was banned, read it, research it, form an opinion on it, and then participate in a mock trial experience centering on the future banishment of the book.

- Another group of math teachers decided that simply assigning their students problem sets was not actually working for anyone — the teachers included, who were exhausted from so much necessary grading. They worked together to develop an escape room activity, one in which the students entering the room took on the role of code breakers in a high-stakes theatrical scenario. The nuts and bolts of breaking the code depended on math formulas, but the story provided engagement and fun for everyone involved. In the lead-up to the event, the teachers had presented different formulas relevant to codes throughout history; and, after the escape room experience, the teachers asked students to rationalize their work before, and at the end, discovering if they were correct or not (and had subsequently saved the day).

These are just three examples. There are hundreds of different types of possible project-based learning plans. We'll include a few more ideas for math PBL modules below. See if any of these general types of project ideas would be suitable for your classroom and student population (PowerSchool, 2021):

1. Challenge your students to create the ultimate design: Give your students a brief background into something that's challenging in the world today, and ask them to solve that problem or provide a somewhat realistic solution to the problem using a mathematical model.

2. Give your students a theoretical budget, and challenge them to do something awesome with it. For example, ask them to contemplate what the best possible way to benefit their community for just $25.00 would be.

3. Run the deserted island simulation: Tell your students that they've woken up one morning stranded somewhere in an isolated location. Not only must they survive, but they must also find a way to design a civilization that will be safe and secure for years to come. What type of society do they build? How do they go about doing so?

If you're interested in finding lesson plans for inspiration, there are many PBL plans available on the internet (particularly on Pinterest) (PowerSchool, 2021).

Section 1 Key Points

- It's critical that students are able to respond to and investigate a complex, engaging, and authentic problem with their whole attention. In addition, it is important that they *feel* engaged and empowered.

- Well-designed project-based learning can help prepare students for their adult life in the workforce. As adults, we tend to take on a series of projects — so putting students through similar paces is a good way to get ready for reality.

- PBL's seven essential elements include a strong focus on student choice, feedback and revision throughout the project cycle, and open-ended questions to prompt true curiosity and creativity as an alternative to rote educational methods.

- PBL can be structured around solo investigation or group activities, as long as the focus is on giving students a complete and beneficial educational experience with tangible value.

- PBL helps school-taught lessons transcend traditional subject matter. Through PBL, a student will learn time management, presentation skills, organizational skills, communication skills, and more.
- PBL allows students to start with autonomy and purpose and see results as they work toward mastery, making PBL a very compelling experience for both students and teachers alike.
- PBL is a relatively new concept, so it may not have as much traditional support, for example—and onboarding students to a new project can seem very overwhelming for students.

Section 1 Conclusion

PBL is an educational framework that puts students in the driver's seat. It can lead to many benefits for everyone involved, but it can be difficult to get popular support! One thing that may help is having a good amount of clear research backing up your decision to dabble in PBL. In the next section, we'll take a quick look at two recent studies that can help in this area.

Section 2: The Science Behind Project-Based Learning

PBL has been a subject of numerous studies over the past decade. FIndings from two brand-new studies have provided a great deal of support for the PBL approach — particularly in terms of successful academic outcomes for historically marginalized populations of students. Important takeaways from those studies are summarized below.

Conducted by researchers out of both Michigan State University and the University of Southern California, these two innovative gold-standard studies sought to determine whether there is a demonstrable, causal relationship between the implementation of PBL and better educational outcomes for the involved students (Terada, 2021).

Between the two studies, some 6,000 students were studied. The studies included the participation of over 100 schools across the United States. Notably, for the purposes of this study, over 50% of the students included came from low-income households. This is significant because, unfortunately, it has become extremely clear that household levels of income are very strongly correlated with levels of achievement (Terada, 2021).

The Research-Backed Benefits for Advanced Placement Classrooms

One of the studies focused on the benefits of reimagining AP, or Advanced Placement courses through a PBL lens. The AP courses in question were concentrated in Environmental Science and U.S. Government and Politics. The teachers responsible for these courses had diverse backgrounds, ranging from the humanities to the sciences. The educators were asked to craft their coursework around project-based activities related to their fields of study (Terada, 2021).

The educators responded well, introducing their classes to activities such as (Terada, 2021):

- Simulations of elections, electoral caucuses, and traditional debates surrounding elections
- Re-enactments of historic Supreme Court cases, where students took on roles either inside the case (arguing as prosecutors and defenders in mock court) or as reporters, telling the tale to the public on the outside

After seeing the semesters through to their end, the researchers studied the scores of the students in project-based classrooms who took AP tests as compared to students in more traditionally-taught classrooms. What they found told a clear story: The students in the project-based classroom outperformed their peers by an average of eight percentage points. When the researchers looked more at the demographic data from the students who took and received higher scores on their AP tests, they found that students from lower-income homes and neighborhoods were represented in similar numbers among the higher performers as are their peers who were from higher-income areas (Terada, 2021).

The researchers, in interpreting their findings, made the case that high-quality PBL can make learning more equitable than more teacher-centric educational approaches.

This case was only strengthened when the researchers followed the PBL classrooms through a second year of instruction. In the second year, the researchers found that the improvements in educational efficacy associated with PBL were durable: In the second year, students in PBL classrooms scored a full 10 points, on average, higher on their AP tests than did their peers (Terada, 2021).

For some time now, the national educational community has been looking for equitable ways to teach students from diverse backgrounds. The student population is becoming

more and more diverse, so this is a clear need that will have to be met now and in the future (Terada, 2021).

One of the lead researchers on the AP student study, an investigator from USC, said: “There’s a belief among some educators and some policymakers that students from underserved backgrounds… aren’t ready to have student-centered instruction where they’re driving their own learning” (Terada, 2021). Clearly, these studies dispute this notion and demonstrate the value of this type of learning.

After looking at the data, the researchers also concluded that, on a national level, approximately 30% of students from lower-income homes tend to take AP tests. When those same students were educated in a PBL classroom, that number increased significantly to almost 40%. Put another way: With PBL, more lower-income students take and pass their AP tests — which can unlock significant opportunities for them later in life. This was an extremely significant finding, as AP classes and AP testing are very focused on results. In previous years, these classes in particular have gotten a bad rap for “teaching to the test.” With the results of this study, it’s becoming clear that this doesn’t have to be the case (Terada, 2021).

The USC researcher posited one reason why she believed PBL learning was so much more effective for students overall: “There were more connections to their real lives. For example, in the AP Environmental Science course, they were learning about their ecological footprint and thinking: How do my behaviors affect the health of my community and of the larger world?” (Terada, 2021)

More Authentic Learning Observed in Elementary-Level PBL Coursework

The second study focused more on the educational experiences of much younger children. The researchers also wanted to determine whether PBL could help students in earlier grades — in this case, third grade — connect more to the world around them. One educator in this study created a “Toy Unit” that actually helped his young students grasp (literally) the concepts of friction, gravity, direction, and force. He spent some time making “toys” himself with cheap, freely-available materials such as milk cartons, straws, and water bottles. He tasked his students with building simple machines from those building parts that were based on electrical or magnetic force (Terada, 2021).

This classroom wasn't the only one exploring simple ways for young children to engage with scientific principles. Michigan State University and the University of Michigan looked at the learning incomes of over 2300 third-grade students in almost fifty schools across the nation. In the study, students were randomly assigned to either a control group (where the teacher taught in a more traditional lecture-based manner) or to a PBL group, where the focus was more on tactile play and experimentation (Terada, 2021).

When designing the study, the researchers made sure that the schools selected represented a typically diverse population. Of the student bodies, about 60% were either students of color or eligible for reduced-price lunch, or both (Terada, 2021).

At the end of the study period, the researchers examined the students' test performance. Again, on average, the students in PBL classrooms outperformed their peers by about 8 percentage points. These results held steady across all included reading ability levels and socioeconomic classes (Terada, 2021).

Section 2 Key Points

- The researchers in the gold-standard PBL study centered on AP students found that students from lower-income homes and neighborhoods were represented in similar numbers among the higher performers as are their peers who were from higher-income areas.
- As a result, the researchers posited (based on their findings) that PBL can be a very equitable option for instruction, even in AP classes.
- The researchers found that their results were durable, noting similar achievement data after the second year of observation.
- Researchers overseeing a different gold-standard PBL study aimed at learning about the achievement levels of much younger students found very similar results. Across the board, PBL seems to be an extremely effective way of teaching students from a variety of backgrounds.

Section 2 Conclusion

Two recent gold-standard studies have shown that PBL is an efficient, effective, and equitable teaching strategy—making it a feasible and desirable option that could potentially solve numerous issues that our modern world faces. Knowing this, the next

important step is to have strategies in place to make PBL a reality for teachers and their students.

Section 3: Implementing Project-Based Learning Into Your Classroom

As you begin to implement PBL instruction into your style of teaching, it's important to remember that PBL modules and more direct, traditional styles of instruction don't have to be mutually exclusive. In the third section of this course, we'll provide a few ideas for ways that you can transition to PBL as it becomes appropriate for your specific population of students. As remote learning is becoming more common, we'll also talk about ways to make PBL work for you if you're in a remote or hybrid educational situation.

When moving your students through a PBL endeavor from start to finish, one of the key factors is student motivation and direction. As a result, you will likely adopt more of a mentoring and coaching mindset as you help guide your students through the project.

How Can I Help Students Move Through a Project, from Start to Finish?

The start and finish of a PBL module can be overwhelming and formidable. From the beginning of a project, where you'll need to help students get familiar with a significant amount of information very quickly, to the end of a project and the presentation, you will need to help your students tackle many unfamiliar and potentially-difficult things.

Think of yourself as a coach. For example, In an athletic setting, when you're getting young swimmers ready to compete against athletes from another team, you have to ensure that the swimmers have a productive, competitive mindset throughout a long series of challenging, repetitive tasks. You need to keep up your swimmers' morale during long workouts and hard work to prepare them for their end goal (McDowell, 2021).

Your students will need to do something similar. Here are three strategies to help you make sure that they are ready to make it across the finish line:

- **Instruct them with care.** Naturally, this is something you'll be doing already, but you'll need to tailor your teaching strategies to help guide your students toward motivation and a sense of self-instruction. You'll need to check in with your students frequently to make sure that they're understanding the material, not just skating through a fun project. You'll need to work with them to make sure that their projects offer many different opportunities to practice their skills. You'll need to provide consistent feedback to ensure that their project stays on track. And you'll need to direct them to collaborate with other students and teachers as best suits their project. Practical tips that could help in this area include (McDowell, 2021):
    - Spend time at the beginning of your student's project giving them a good amount of direct instruction. Make sure that your students have a grasp on the high-level key facts they'll need to accomplish their project successfully. This is the time for the most teacher-led feedback.
    - As your student moves through the project, ramp down on direct instruction. When you do spend time with your students, ask them to describe what they're learning. Work with them to make sure that they're consolidating their skills and the various concepts they're learning. During this stage of the project and your instruction, your feedback should be more discussion-based.
    - Toward the end of the project, your direct instruction should be relatively minimal. Feedback for your students should come from their peers, with you more monitoring for accuracy and offering practical tips on presentation.
- **Think carefully about the way you monitor their progress.** Consider the young swimmers again. They might monitor their progress against a clock and constantly assess whether they have the proper technique and form to get them to their goals. Your students may be used to monitoring their progress through exams and numeric scores, and PBL is a little different. Your students will need to learn how to evaluate their own progress. They'll need to compare drafts of presentations to previous drafts, for example, to build their own sense of whether something is working or not. You'll need to introduce them to the idea of taking responsibility for their own learning and the objective quality of their own work. Practical steps that may help in this area include (McDowell, 2021):

    - Give your students examples of work that is great, good, poor, and clearly substandard. Ask your students to review their own work in comparison to the examples you've provided. In the beginning, offer your own evaluation of the students' work to help bolster their confidence in their own assessment skills, but, as your students gain confidence and show accuracy in their evaluations, ramp down your own assessments.

    - Make sure that your students keep examples of their own work throughout the project so they can look back and see how they've improved. It's often difficult for students to see how their skills are progressing, so keeping concrete examples can be very helpful.

    - Help your students come up with milestones and times to check in with themselves to assess their own performance.

- **Help your students develop and test the best practice tasks possible.** Again, we'll think about the way swimmers improve. Their overall goal—their project, if you will—is to win a race (or get a great time in an event). However, when they're moving toward that goal, they'll do things other than simply swimming the specific race over and over again. They'll sprint shorter distances, participate in longer endurance events, and even cross-train outside the pool to make their muscles stronger. When your students are moving toward their goals, help them come up with smaller things to practice on a daily or weekly basis that will help them achieve that goal — smaller things that may or may not be obvious to them. Practical steps that may help in this area include (McDowell, 2021):

    - Assigning your students cognitive tasks that may help them work toward their goals and sharpen their skills (such as leading a small group in discussion, for example, or editing another student's work).

    - Providing your students with work examples that are either great or not-so-great and asking them in an informal manner what their opinion is on each. Having them call out specific reasons why the sample is exemplary or why they would recommend changes is ideal.

    - Helping your student build a protocol for giving feedback on someone else's work. The focus should be entirely on grading work that is not their own and providing constructive criticism in an empathetic manner. Of course, the student will likely be able to apply the same thought to their own work, but that shouldn't be the main point of this exercise.

Getting Parents on Board with Project-Based Learning

When you're the teacher in your area pioneering PBL, you might be met with a certain level of resistance from the parents. Many parents are skeptical about projects supplanting the teaching methods they're more familiar with, and that makes sense. They may be thinking of the projects they experienced when they were children — or imagining that you're simply going to be requiring a lot of time, attention, and further investment from the parents themselves as they "help" their students move through a project successfully (Piper, 2021).

Dispelling these notions upfront is clearly a good idea, but you'll need to follow up any type of 'this is not a traditional project' announcement with clear guidance to help parents be invested in this new type of learning strategy. Here are some ways to spark interest among the parents at your school (Piper, 2021).

1. Start by simply communicating, early and often, that PBL is different from simply doing more projects. At the beginning of the semester, sit the parents of students in your classroom down and tell them that you're trying something new — but it really isn't something that is particularly outlandish. Show them the strong base of evidence supporting its benefits (hint: The studies in Section Two may be a good place to start.) You might also have to adopt some simple marketing strategies to help the parents realize that this is something new and innovative. For example, consider the vocabulary you're using to casually describe what you're doing. Are parents listening to you and envisioning that you're about to bring out construction paper and scissors? Or are you communicating that you're going to empower your young students to complete work that helps build individualism, communication, critical thinking, and creativity? Tie the benefits of PBL to the long-term ambitions you have for your students, and be confident in the teaching method you've chosen. This will go a long way toward ensuring that the parents are backing what you do.

2. Think carefully about the projects you start the year with from a parental point of view. Your assignments will be met with more scrutiny at the beginning of the semester, so ensure that those first few lessons are especially engaging, collaborative, and exciting — yet, also, accessible and likely successes. If there's a project that's a bit more of a slow burn or more ambitious and risky, save those for a little later in the year, when you've established yourself and the students have more experience with PBL. In addition, it may be a good idea to tackle a classroom-wide 'mini-project' that only lasts a week or so, followed by some type

of traditional assessment, to prove to yourself, your students, and their parents that you can help students retain information in a new and more engaging way.

3. Come up with a quick elevator pitch for PBL. As you pivot to this new learning model, you'll get approached by parents, colleagues, and even community members or investors who will want you to explain very clearly and quickly what the difference between PBL and 'doing projects' is. One helpful phrase might be something along the lines of "designing projects around key learning standards — standards that include those assessed on an exam such as a standardized test or AP exam." You can also turn it around on the parents and ask them to think of the difference between a really satisfying, hands-on work project versus a routine lecture. The parents will likely be able to recall their own varying levels of engagement and start to see what you're doing. Pointing out that you're planning on helping students get to a place where they can feel engaged and can ace traditional exams will also help.

How to Make PBL Modules Ultra-Engaging for Kids: Tie Them Very Closely to Real-World Problem Solving

We've talked about how to help kids understand the mechanics of a project and we've discussed ways to get their parents on board. Now, let's discuss a surefire way to ensure that children are really engaged with what's happening: Making previously-vague problems as critical and realistic as possible.

There are several reasons why this is a good thing. First and foremost, the messier, faster, and more true-to-life the problems students face in school are, the more they'll be prepared for problem-solving in adult life (McDowell, 2022).

Again, a very important element of PBL is making simulated problems for your students as realistic and engaging as possible. As was the case throughout the country, one school superintendent was facing numerous challenges as she was working to keep her schools running efficiently during a pandemic (certainly a real-life problem requiring keen management skills). As she worked through the struggles, she noted that the problems she faced had a few key features potentially worth replicating for her students.

Those features were as follows (McDowell, 2021):

- The superintendent was never thrown just one specific problem to solve at a time, or several of the same kinds of problems to consider in a neat line. Rather,

the superintendent faced many new and different issues that she and a team of people constantly needed to learn from, prioritize, and solve as efficiently as they could in a set amount of time. This required good decision-making skills as well as good problem-solving skills.

- The superintendent realized that the problems she and her team faced changed over time — requiring her community to constantly re-evaluate the solutions they created, communicate quickly, anticipate multiple different scenarios, and prepare as best they could for anything that could happen. While something like this might be beyond the scope of a fourth-grader, giving them evolving, surprising problems that help them learn to be quick-thinking will both challenge and help them.

Based on her obstacles and successes derived from her experiences, the superintendent ideated five specific examples of strategies to drive authenticity within a PBL framework (McDowell, 2022):

1. Ask students to derive the central question fueling a project from several different contexts — or ask them to select from many issues in one complex context. For example, in one third-grade classroom, the students were assigned a book about the introduction of the Keystone pipeline and the requisite challenges that Native Americans face. The teacher might then introduce a few different contexts for similar issues (e.g., cobalt mining and its negative impact on rural Africa, or how wind farms are causing some species of birds to decline). The students might then group together to determine the core of the challenges that these native species and Indigenous peoples face. To aid and build their projects, they might develop questions about what they want to learn, and, from there, determine how they might go about answering those questions. This will feel far more compelling to students than simply being tasked with a question by a teacher.

2. Present students with changing, fluid problem environments instead of static problem sets. This will be much more representative of the way students will actually experience problems in real life. For example, in one AP economics class, the teacher had her students analyze the changing supply and demand of a popular video game system. This was, naturally, a data point that was destined to ebb and flow over time. For the project, she had her students assume the role of a profit advisor for the company that produced the game system. Over the course of the PBL module, the teacher had the students scanning reliable news sources every morning to learn the latest status of the market for that specific video game

console — as well as any factors (e.g., governmental restrictions, supply chain fiascoes) that could affect the supply available to the producer. After getting a sense of what was happening in the world, the students would have to prepare quick daily reports to "advise" their "client." This felt fun and timely — but also gave the students vital information about the real-life supply chain issues affecting America. On a more meta level, the project required the students to learn fast and effective conversational skills, competency and responsibility, the ability to work together in small groups, and what it felt like to issue recommendations for business strategies at such a high level. As many of those AP economics students were surely headed for at least some type of similar role in their actual careers, this class was well-suited to its audience and interesting for all involved.

3. Ask students to create presentations, not as high-stakes, meticulously-edited performance work, but shorter, rougher sketches that are allowed to be imperfect but more closely aligned with what a student actually thinks. In one seventh-grade classroom, students were asked to send in persuasive essays on a wide number of topics. To add some spice to this relatively routine assignment, throughout the drafting process, students were randomly asked to present their current draft, current ideas, and the general state of their paper. The other students in the classroom were asked to provide feedback on both the writing and the content at this time. While this is a relatively anxiety-inducing exercise, it's very true-to-life — for both the students presenting their evolving ideas and the students providing feedback. If you decide to take advantage of this type of activity in your classroom, it might be a good idea to allow students many different ways to present — e.g., not always standing up in front of a room and talking. They might have the opportunity to share an in-progress Google doc, for example, instead. However, it should also be noted that as scary as this process might feel the first week it's implemented, if it's a process that becomes routine in your classroom, it will both feel less scary and prepare students well for this extremely common business practice.

4. Have an authentically-interested audience engage with the students throughout the formation of the project, not just during a summary presentation at the beginning or during a kickoff meeting at the front end. In one fifth-grade art class, the students were asked to create a series of murals that represented their community. Over the course of this project, the students were tasked with meeting with various community members as well as local artists to learn more

about the community, get feedback on their plans from the artists, and complete other related tasks. In this way, the structure that was put into place ensured that students were receiving guidance and feedback throughout the project, instead of just at the end—which is simultaneously more helpful and less stressful.

5. Finally, have your students tackle smaller, more traditional sets of problems, just under short bursts of time. This constraint alone confers a game show type quality on a relatively traditional type of assignment. For instance, in one Algebra II class, students were tasked with working with logarithms to understand some biological scenarios. Each student was using the same type of mathematical tool (e.g., logarithms), but each was looking at a different biological system. The students were grouped to share what they were learning, evaluate each other's work, and see if there were any connections between what they were experiencing. This teaches students the ability to work quickly on temporary, challenging work—which feels much more appealing than working through a complex and lengthy problem set on your own.

As you're onboarding your classroom and parents to this new type of learning, consider the following talking points: introduce them, repeat them, and send them to parents in emails. Hopefully, this will help dispel the notion that you're simply a fan of assigning monotonous projects (Piper, 2021):

1. Through intentional, specifically chosen, and carefully-designed projects, PBL allows your students to grow and practice the 21st-century skills that will help them find success in college, work, and even in a happy adult personal life. For example, teaching students how to tackle unstructured problems and communicate well now will help them for the rest of their lives.

2. With PBL, the students in the classroom enjoy more of a sense of responsibility for their learning. Not only does this make learning more engaging for young people, it teaches them early on that they will be responsible for their success later in life.

3. Studies consistently demonstrate that students who participate in project-based learning outperform students taught through more traditional methods on key assessments. (This will likely be a very compelling point, so it may be a good idea to find recent studies, perhaps out of well-known and respected research institutions, with effective, easy-to-understand visuals to share with parents.)

4. Well-designed projects allow students to show us what they can do in a much deeper way than the average test. Projects also allow students the chance to challenge themselves, to figure out what they want to do in life, grow closer to their peers, and eventually require less support for success much more quickly. All of these are incredible benefits for young people.

When you're starting a PBL module, you'll need to figure out a way to inform and connect with parents in a meaningful way. Just as with any other learning strategy, you'll find that you have a better chance of success if the parents are helping their students at home. However, with PBL, it's also key to tell your students' parents that they won't be expected to complete projects for their children. With effective communication of the above talking points, you'll be well-set to ensure that parents are ready to support their students' success.

Can PBL Work Within a Hybrid Teaching Model?

PBL is nontraditional in and of itself, so it may be difficult to imagine that it could work with other currently-nontraditional forms of education, such as hybrid teaching. However, as hybrid classrooms are becoming more and more common, it's increasingly clear that disallowing students in hybrid classrooms from experiencing the benefits of hybrid education would be a disservice for everyone involved.

For example, one of the key benefits of PBL is its ability to teach students how to communicate and collaborate well, both for their mental health and to get them ready for the type of collaboration they will experience in college and in their adult lives. Students in hybrid environments may not have much time to spend with their peers in person, so they especially have a great need for these types of experiences. Teachers working in hybrid classrooms do their best to ensure that all students have the opportunity to share about themselves, but it isn't always possible to provide more than a minute or so for each student to give a few basic facts about their lives (Miller, Kelly, and Krajcik, 2021).

When students are collaborating on real-life projects over a longer-term period, they will naturally share parts of themselves that they might not think of in a more formal setting. It will be easier to form a community, feel natural, make connections, and find support in tough situations (Miller, Kelly, and Krajcik, March 2021).

This might seem like a dream-worthy scenario, but it's very possible to use PBL to foster community in a hybrid academic setting. Here are a few strategies that you might be able to leverage to make it easier in your classroom:

- **See if you can strategically use the questions you provide students or prompt them to use in order to strengthen the relationships around them.** This should include your relationship with your students. Teachers in all types of classrooms, hybrid and in-person, build trust and a rapport with their students by asking their students, very simply, what they're interested in. Why? Doing so provides a very low-stress way to help students build communication skills. (The content, if you will, is already very accessible to the child—it's something they like—so all they need to worry about is the transmission) (Miller, Kelly, and Krajcik, March 2021).

  In order to bring this same sense of accessible, enjoyable communication one step closer to an academic sphere, it may be ideal to have a low-stakes forum each week in which all students get a few minutes to talk about whatever they please (within reason). One set of hybrid science teachers decided to follow this pattern. They scheduled a weekly "genius hour," in which every student had a chance to research answers to a set of scientific (but carefully planned to be "fun") questions. They were then asked to informally talk about what they learned, after being told that they weren't being graded—but rather it was just supposed to be an interesting conversation about, say, how many Oreos it would take to reach the moon (Miller, Kelly, and Krajcik, March 2021).

  Over time, the science teachers realized that many of their remote students really enjoyed having an audience in that lower-stress way, and even though they weren't being formally assessed watching students stumble through lightning-quick investigations did show the teachers and students alike a great deal about their burgeoning project management skills. Of course, not every student will be thrilled with the idea of an impromptu presentation. A hybrid fourth- and fifth-grade teacher decided to adopt a similar model, while allowing her students complete choice as to how they wanted to share their answers: For example, they could call in so only their voice was audible, they could send in a pre-recorded voice message, or they could simply type their thoughts into a shared Google doc (Miller, Kelly, and Krajcik, March 2021).

  Another science teacher took the choice out of the matter but opted for the lowest-stakes type of communication for her students: She held a "chat blast" session in a shared chatroom, publishing her research questions at the top of the

hour and giving her remote students a set amount of time to type their way to an answer (Miller, Kelly, and Krajcik, March 2021).

- **Find ways to give fully-remote students a say in hybrid classrooms.** Hybrid classrooms in particular can be very tricky, as you are building an in-person presence and community that not every student can experience, at least not all of the time. To help overcome this in her hybrid classroom through an ongoing project, one teacher strategically paired students together to ensure that one person of the pair was always in the classroom. She told the students who were in the classroom that they were responsible for checking in with their partners throughout the day, so that everyone had at least one point of personal connection, even if they were remote. In a PBL setting specifically, this had concrete benefits — the students who were on-site were then tasked with handling any tactile work, and the students who were remote took the time to do more in-depth supporting research online or with materials provided by the teacher. The same teacher also provided the remote students with ways they could experience classroom activities using materials that they likely already had on hand at home. When leading an experiment in her classroom, for example, she'd turn to her remote students and walk them through, for example, heating up water in a microwave, or adding simple ingredients together in a bowl. (She worked with remote families beforehand to ensure that they had the basic materials on hand.) That way, all students involved felt that they could participate, at least to some extent (Miller, Kelly, and Krajcik, March 2021).
- **Choose your applications strategically.** One teacher found that the educational and communication apps that her school recommended only worked with extremely high-bandwidth internet, a resource that the remote students in her care just didn't universally have. As a result, when she tried to do high-interest activities with her remote and in-classroom students, the remote students were always lagging behind. This created clear division in her classroom. The teacher took time to research different communication apps before deciding to opt for an all-chat-based (but lightning-fast) educational app. She still requires the use of video cameras at some points of her students' day, as is currently recommended by her school district, but during parts of the day's activities, she asks students to turn on the chat app and she shares her screen so that everyone can truly see what's happening in real-time. The in-person students use the chat app, as well, instead of simply raising their hands and speaking. This allows her remote students an equal chance at certain types of fun activities — say, trivia

competitions — that the teacher uses for variety in her classroom (Miller, Kelly, and Krajcik, March 2021).

Can I Make Virtual PBL Work?

As we've discussed, it's entirely possible to make PBL a rewarding educational strategy in a hybrid scenario, but many recommended strategies in that area did rely pretty heavily on making full use of the time that students were in the classroom. If there is zero in-classroom time, as is becoming more popular in many parts of the nation, is there a way that you can incorporate PBL effectively?

There is. In this section, we'll discuss four proven strategies to leverage PBL as well as possible in an entirely virtual situation. The recent pandemic gave the academic community as a whole the permission to revisit and re-assess what it is that learning should truly focus on. For many, the skills that we hope to imbue in our students — curiosity, investigative skills, social collaboration, communication skills — are best taught through PBL (Miller, Kelly, and Krajcik, January 2021).

As many students are now learning remotely, we'd hardly want to exclude a growing sector of the population from these values. To ensure that this does not happen, one team of teachers, researchers, and curriculum developers worked together to reconfigure a series of popular face-to-face PBL units for younger grades. The goal? To allow the lessons to keep their signature collaborative feel—without relying on in-person teaching to attain the hoped-for results (Miller, Kelly, and Krajcik, January 2021).

This exercise resulted in several specific findings regarding the efficacy of project-based virtual learning (Miller, Kelly, and Krajcik, January 2021).

- Students can still learn collaboratively, even when they're apart. It's important, particularly in a virtual setting, that students are active participants in their learning journey—not passive observers. Even if students can't be putting their hands-on materials in order to complete investigations, working together with their peers and sharing the burden of solving puzzles and problems is a good way to build a community of learners ready to work together.
- It's not necessary for parents to facilitate complex, expensive projects built at home during off-hours — projects then shared by students during the virtual time spent with their peers in class. This is hardly a selling point for parents to get involved in virtual PBL, and it really misses the point: PBL isn't about solo crafting

followed by communal show and tell. It's about building something with your peers with social motivation and shared creativity.

- In one teacher's virtual third-grade classroom, the teacher asked students to use in-class time to search for materials around their homes. Then, on-camera, the entire class worked together to manipulate those specific items to create a toy. For example, one student used a margarine lid to create a basic flying toy, complete with stabilizing fins. The teacher used this as a prompt to launch a conversation around the way opposing forces allow flight. Another student turned an egg carton in a boat, blowing the boat across a pail of water to add another angle to her peer's flying machine and requisite discussion.

- Whenever possible, teachers should utilize very real-world examples not just as illustrative points, but as actual activities. This is, perhaps, one of the best definitions of PBL; where traditional learning tends to take place on an intangible level, inside our student's brains, PBL very much occurs within the real world. One science teacher decided to capitalize on this by having her students ask scientific questions surrounding a phenomenon we were all experiencing at the same time. This type of reasoned critique is an essential 21st-century workplace skill, and it doesn't need to happen in person. The teacher streamed a video for her remote class of a specific recent scientific finding, with a parallel chatroom for active student queries.

- Of course, this doesn't need to happen via a video. Another teacher, one educating a group of remote fourth graders, was teaching a module about light and shadows. At some point during the lesson, the teacher asked her students to go outside with their cameras to observe, draw, and ask questions about their cameras. The students used their cameras to stream their shadows over Zoom. The teacher then asked the students to compare their shadows to each other, to draw conclusions about the weather (and other atmospheric conditions and qualities) in each student's unique place. In doing so, the teacher took advantage of the thing that is often considered a fundamental weakness of remote learning: That everyone is in a different spot. Given that separation, the teacher decided to use everyone's individual location as a way to jumpstart an interesting conversation.

- Nonverbal communication is incredibly powerful. In fact, nonverbal communication is often described as something that is just as vital to comprehension and relationship-forming as verbal communication. This is

> something that is also, often, noted as a fundamental weakness of remote learning; we don't tend to get as much of a sense for what other people are actually trying to say because we miss out on an entire, very fundamental aspect of their holistic meaning. One way to get around that is to call it out. Students and teachers alike may need very specific training in nonverbal communication through a camera.

At the beginning of your school semester, set aside a period of classroom time to run through the importance of things like nods, eye contact, smiles, gestures, and even proximity to the camera, to help both teachers and students get their ideas across as effectively as possible. If you, as a teacher, prioritize eye contact and warm gestures, your students will feel more comfortable taking risks with their communication over the camera. (We've all likely felt some version of this in action: When we see that the other people in the Zoom room we're presenting to are smiling and nodding, it's much easier to keep talking) (Miller, Kelly, and Krajcik, January 2021).

One easy way to present this information and this challenge is to play a game of charades. One teacher used a randomizer app to present different concepts — emotions, for example, or bits of hypothetical good, bad, or exciting news — and then asked students (over the camera) to show that concept without using words. This teacher even took the game a little further and mixed in abstract scientific concepts into the game, so the entire class was able to laugh over the way another student, say, tried to act out the existence of electron bonding. This type of informal activity helped bring awareness to students about the importance of their gestures. Repeated a few times throughout the semester, this activity can really help transform the level of communication in your classroom (Miller, Kelly, and Krajcik, January 2021).

Another important consideration is that students should be allowed some level of freedom over the way that they exhibit their learning and their expertise. Instead of being asked to create a diorama, give a five-minute talk, or have an intimidating one-on-one with their teacher, students should be allowed to identify and exploit their creativity to show what they have come to understand in your classroom. This will alleviate a lot of mental stress for students, allow them to realize what their own strengths are, and lead to much more interesting classroom presentations. In the beginning, students may require your help and creativity to understand the wide range of media available to them as they figure out how they want to tell a story (Miller, Kelly, and Krajcik, January 2021).

Once students understand that they can write a song, film a video, draw a comic or partner with a friend to write a humorous sketch about the given topic, they should naturally be much more interested in working toward a demonstration of their mastery of a subject. Taking ownership of the demonstration in this way will help the student understand the central idea much better. To help facilitate this type of creativity, it may be a good idea to create a central repository of presentation tools, formats, and ideas in some kind of shared folder on your digital educational platform. There are free online tools that, once vetted for safety, will allow students to record drawings, videos, and more (Miller, Kelly, and Krajcik, January 2021). Additionally. If you're looking for a simple way to inject some excitement and enthusiasm into a project, send something to each student's physical address. One creative physics teacher bought the components for a simple clock and mailed one part to each member of her class. Working together in a forty-five-minute time frame, the class had to examine the pieces and discuss over a video call what the pieces could possibly represent.

As it turns out, when you're investing in PBL over a camera, you just have to prioritize some type of creativity and communal motivation and enthusiasm—much like you would in person. Fortunately, you don't need to reinvent the wheel. If you're looking for specific activities and lesson plans you can leverage as a teacher putting together a PBL curriculum for your remote classroom, there are many that already exist online. Peruse Pinterest or social media for ideas, and you'll soon have more than enough fun activities from which to launch your own lesson plans! (Miller, Kelly, and Krajcik, January 2021)

How can I best leverage PBL for English Language Learners? What about students with special needs?

The short answer is simple: You leverage PBL in much the same way as you might for more traditionally-abled peers, or for students for whom English is their first language. You do need to do a little more front loading and consider how students with specific sets of abilities may be able to select projects; but, as the bulk of the way that a PBL module rolls out is left up to student choice, the general strategies with which you might approach a PBL project remain this same (Wolpert-Gawron, 2018).

The goal of PBL is to help students embrace independent learning. This is just as important for students learning English or for students with special needs — if not more important, as they'll be learning and working in a world that won't always understand or prioritize their needs. Your job as their teacher remains the same: Giving them the

resources they require in order to unlock learning for themselves. One might argue that PBL is the best choice to help students with special needs or English learners ramp-up to independent learning the most quickly (Wolpert-Gawron, 2018).

One expert agrees, stating simply that "In PBL, English Learners develop a sense of agency and take ownership of their learning… simultaneously practicing academic language and literacy skills while engaging in critical thinking." This is, of course, not to say that teaching PBL to students who require specific types of support will be easy. Depending on the specific population you're supporting, you may need to incorporate specific practices and strategies into your teaching habits (Wolpert-Gawron, 2018).

Here are some proven strategies that PBL teachers and experts have incorporated to effectively scaffold PBL for English Learning (EL) students and students with special needs. Think about your student population and see which of these strategies might work best for you (Wolpert-Gawron, 2018).

- **Ensure that you're providing a wide range of eminently-accessible research for students to choose from.** While you might release a group of English-speaking or non-disabled students into the wild to find research on their own, this may not be the most effective strategy for students who require more support. At the very least, this can seem very overwhelming. Instead, as you're helping them get acquainted with the subject material for their project, give them a few options of research materials. In addition, make it clear they can find other resources if they wish, if appropriate. These may range from traditional classroom resources such as lectures and textbooks to online videos, magazines, library books, or podcasts.

- **Use as many visuals as possible to support classroom success.** This will not only allow you to be more universally understood, but it can also help you be more efficient in your educational strategies. Illustrate common classroom procedures, what you hope students achieve through projects, communication strategies, and as much course material as possible with videos, icons, GIFs, or static images. If you're providing information about a process your students will consistently leverage (e.g., a specific way to solve a math equation), find a way to turn your instructions into a video that your students can watch again and again as they move toward mastery of that type of problem on their own.

- **At the beginning of a new subject, take some time to review the key concepts and vocabulary that will be used in the near future.** This type of review may feel redundant for English speakers, for example, but giving English learners and

students with special needs the toolkit they need to understand more advanced concepts as they arise (with visual aids to use throughout the year) will reduce friction later.

- **If all of your students will be tackling similar projects, create a visual roadmap of what they will be doing.** Tack this roadmap up on your wall, or make it a PDF that your students can reference often. Use this diagram in class, either pointing to it on your wall or sharing it on your screen, to help ground your students in what they're doing—and give them perspective about what they will be tackling in the future.

- **Take time to specifically teach your students the nuts and bolts of collaboration.** This may or may not come naturally to any student, no matter what their background or strengths. Taking time to establish ground rules and expectations instead of throwing a social challenge and the obstacle of collaborative task management at your students will make collaboration much easier. In games in your classroom, have your students practice conversing, disagreeing productively, making constructive observations, and providing positive feedback to support each other as much as possible. If it would help, you can even give your students prompts, sentence starters, and specific types of language they can use to mediate any difficult interpersonal interactions they may encounter as they begin collaborating with their peers. As the collaboration begins, make sure that you're listening to how the students work together. Provide helpful input as often as you can in order to keep groups on track.

- **If your students are English language learners, take time to actually instruct them directly in English — at least casually, if that isn't your specific aim.** As is appropriate, don't be afraid to give them sentence openers and turns-of-phrase that will help them move in American society with ease. PBL is all about direct instruction. Consider some explicit English language tutelage as a way to increase your students' toolkits, so they feel more comfortable embracing independent study.

- **As is appropriate, don't be afraid to incorporate the specific life experience and background of your students into the PBL process.** You may wish to work with specialized professionals to do this correctly, but it's important that you don't ignore the fact that your students are newcomers to America, differently-abled, or have other backstories that they can leverage. In this way, you can help make it clear to these students specifically that they have a great deal to offer as they

represent their communities, and that their unique challenges should not be something that stands in the way of success. Consider the alternative: Would offering a PBL module to students with special needs or English learners in which you didn't mention their unique abilities feel authentic? Work with caution; perhaps rely on your students' parents to help guide you in what feels safe and appropriate, here, but don't shy away from providing direct, helpful support and instruction.

- **Provide targeted support resources, such as bulletin boards in your classroom with specific keywords.** Earlier, we spoke about the way that a visual roadmap posted somewhere easily referenced can really help students keep track of where they are in a specific project. A similar resource can be really helpful for EL learners and students with special needs. As you help your students move through their projects, provide them with updated reference sheets that outline often-repeated processes, specific keywords and their simple definitions, and even sheets that help them know how to ask for support. (A good example may be a sheet that pairs pictures of people with facial expressions clearly identifiable as different types of emotions, so a student has something very easy to identify, point to, and share if he or she is confused, tired, or distressed.) Build out these resources over the course of the PBL module or semester, so at the end of your time together students have a wide array of very useful resources at their disposal.

Section 3 Key Points

- The amount of instruction you give your PBL students should be at its highest in the beginning of the module. You should lessen that direct instruction as you move through the material.
- Your PBL students will need to learn how to evaluate and be responsible for judging the objective quality of their own work.
- One of the best ways to get parents on board with PBL is to remind them, early and often, that PBL is different from simply doing more (expensive, time-consuming) projects.
- Present students with changing, fluid problem environments instead of static problem sets. This will be much more representative of the way students will actually experience problems in real life.

- Hybrid students need PBL, too! Consider pairing in-person and remote students together to help build community and make your remote students feel more involved.
- Whenever possible, teachers should utilize very real-world examples not just as illustrative points, but as actual activities. This is, perhaps, one of the best definitions of PBL; where traditional learning tends to take place on an intangible level, inside our student's brains, PBL very much occurs within the real world.

Course Summary and Conclusion

The results are in: project-based learning is an educational framework that can be implemented for a wide array of learning scenarios. If you're interested in helping your students grow in creativity and independence, consider working toward a PBL framework. Whether you leverage it in full or just incorporate a few inquiry-based projects in your upcoming semester is up to you, but either way, you and your students are sure to reap the benefits.

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