



Educators and district administrators have long known that project-based learning (PBL), a pedagogy where students learn by engaging in real-world and personally meaningful projects¹, is exceptionally effective when teaching STEM (science, technology, engineering and mathematics) subjects.

However, with the increased need to offer hybrid and distance learning to fight the spread of COVID-19, at first glance, PBL might seem incompatible with these learning environments.

Not being able to offer in-person support may give some teachers pause — especially when it comes to helping students who have vastly different learning needs. This concern is not unwarranted and is one that Carol Ann Tomlinson, professor of education at the University of Virginia, has devoted her career to better understanding.

In the forward to her book, “How to Differentiate Instruction in Mixed-Ability Classrooms,” Tomlinson explains that her theory of differentiated learning, the idea that teachers need to cater their approach to fit the unique learning styles of their students, addresses an obvious truth: there is no “one size fits all” approach to teaching:

“If we elect to use what we know about learning, and, in fact, about ourselves, as we craft classrooms, we acknowledge that students learn in varied ways—some by hearing, others by doing, some alone, others in the company of peers, some in a rapid-fire fashion, others reflectively. We acknowledge, too, that individuals are intrigued or even inspired by different topics or issues, and that curiosity and inspiration are powerful catalysts for learning. To teach well is to attend to all these things.”²



A student creates a prototype of a rubber duck launching device as part of an activity from the National Inventors Hall of Fame.

Though educators instinctively know Tomlinson’s words to be true, with limited time and resources, and the reality that teaching is often just a portion of their responsibilities,³ crafting lesson plans that perfectly align to the myriad learning styles in a given classroom might seem like a luxury.

Thankfully, one of the key benefits of establishing a PBL strategy is that it aligns with the interests of individual students. It gives them the agency to select a challenge they are passionate about and the freedom to solve it in their own unique way.

The Effectiveness of Distanced Project-Based Learning

In an article published by Edutopia, Amy Nichols, a faculty instructor at Arizona Christian University, argues that now is the perfect time for teachers to incorporate PBL because it can “build engagement in remote environments” and give students a sense of control in the midst of uncertain times.⁴

Additionally, Nichols explains that PBL addresses Tomlinson’s concern that standard K-12 education does not do enough to adapt to the needs of individual learning styles. Because students can research a topic in whichever way most interests them, they will not only be naturally more engaged but will also explore the subject using methods that best suit the way they learn.

In her article, Nichols gives an example of asking students to create solutions that address the problem of ocean pollution. By giving a class the autonomy to choose how to explore the issue, they will feel motivated to do their best work:

“It’s up to the students to showcase their best idea in the best format for them. So, if we return to the problem of ocean pollution, some students might invent a machine, others might create a documentary in which they highlight problems and solutions, and still others might write a paper explaining their ideas. They are all answering the driving question in their own way.”⁵

While this active approach to learning has the ability to significantly increase interest and engagement, it’s important to recognize that opportunities like these, especially when they occur in a distance learning setting, must be inclusive and accessible to all students.⁶ This is also a place where PBL excels and can be adapted to fit the needs of districts that serve families who need a wide range of resources.

1. PBL works. *What is PBL?* <https://www.pblworks.org/what-is-pbl>

2. Tomlinson, C. (2017). *How to differentiate instruction in academically diverse classrooms*. <http://www.teacherisfy.org/resources/instruction.pdf>

3. Sutton, A. (2019, December 2). Teachers expected to do it all without enough resources. baltimore sun. com. <https://www.baltimore-sun.com/opinion/op-ed-bs-ed-op-1203-teacher-violence-20191203-jiutozlyrzdfpkzd3skkbugnu-story.html>

4. Nichols, A. (2020, November 18). Using PBL to Boost Online Engagement. Edutopia. <https://www.edutopia.org/article/using-pbl-boost-online-engagement>

5. IBID

6. Freedberg, L. (2020, August 17). Millions of students - and their teachers - embark on vast experiment with distance learning. EdSource. <https://edsource.org/2020/millions-of-students-and-their-teachers-embark-on-vast-experiment-with-distance-learning/638038>

Accessible Project-Based Learning at Home

For John Larmer, Editor-in-Chief at the Buck Institute for Education, incorporating PBL into a district's distance learning curriculum is also an effective way to address discrepancies of resources that differ between households. If, for example, a family lacks access to technology or the internet, Larmer suggests that teachers reassure families that projects can be "low- or no-tech."⁷

For more than three decades, the National Inventors Hall of Fame® (NIHF) has been implementing STEM education programs across the country, and we've seen firsthand the power of encouraging students to use everyday objects to construct invention prototypes.

A great example of this comes from Collegiate Inventors Competition® Finalist team NeoVent, who used a yogurt container and duct tape to prototype their lifesaving infant respirator.⁸ Though everyday household items like cardboard, masking tape and plastic bottles might not look like much, they represent the perfect building blocks for students to explore their ideas and embrace hands-on learning without access to technology.

Implementing Project-Based Learning Today

Transitioning from your standard virtual classroom to more of a PBL approach can be overwhelming, especially if your students have adapted to a set routine or schedule. Because of this, we don't recommend changing your entire approach overnight. Instead, slowly integrate PBL in a way that augments the curriculum that you already plan to teach.



A young innovator experiments with a self-driving robot from the National Inventors Hall of Fame.

Recommended Household Materials for Project-Based Learning

- Small or medium boxes
- Paper towel tubes
- Cannisters and containers
- Cups and lids
- Bubble wrap
- Foam trays
- Rubber bands
- Miscellaneous paper (construction paper, magazines, newspapers, etc.)
- Balls and sporting goods
- Pulleys
- Springs
- Strainers
- Tape
- Washers
- Unwanted toys (building blocks, car/train tracks, game parts, pinwheels, plastic figurines, toy vehicles, etc.)
- Unwanted DVDs, tapes and cases

We are particularly proud of the work that NIHF STEM Middle School is doing in PBL. Based on the model developed at the Illinois Mathematics and Science Academy® (IMSA), as a public school they connect PBL to teaching standards, designs PBL based on the needs and interests of their students and has found practical ways to explore how this pedagogy increases collaboration, creativity and critical thinking.

While parents will likely welcome any kind of learning approach that gets children away from their computer screen, Larmer suggests reassuring families that teachers will be supporting their child's work as they develop their projects.⁹ Similarly, Nichols recommends teachers provide information about projects ahead of time and share weekly overviews of various deadlines to ensure that consistent progress is made over time.¹⁰

To meet the needs of our education partners across the country, NIHF has recently developed a variety of brand new education programs and at-home STEM kits that allow easy PBL implementation in remote, hybrid and in-person classrooms. To learn more about these offerings, we invite you to [visit our website](#).

7. Larmer, J. (2020, April 8). *How Teachers Can Support PBL at Home*. Edutopia. <https://www.edutopia.org/article/how-teachers-can-support-pbl-home>

8. Western Michigan University. (2016, July 11). NeoVent: Breath, Life and Ingenuity. Western Michigan University. <https://wmich.edu/business/2016neovent>

9. Larmer, J. (2020, April 8). *How Teachers Can Support PBL at Home*. Edutopia. <https://www.edutopia.org/article/how-teachers-can-support-pbl-home>

10. Nichols, A. (2020, November 18). *Using PBL to Boost Online Engagement*. Edutopia. <https://www.edutopia.org/article/using-pbl-boost-online-engagement>