

A Guide to Project-Based Learning

for K-12 Educators



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Chapter 1

Introduction to Project-Based Learning

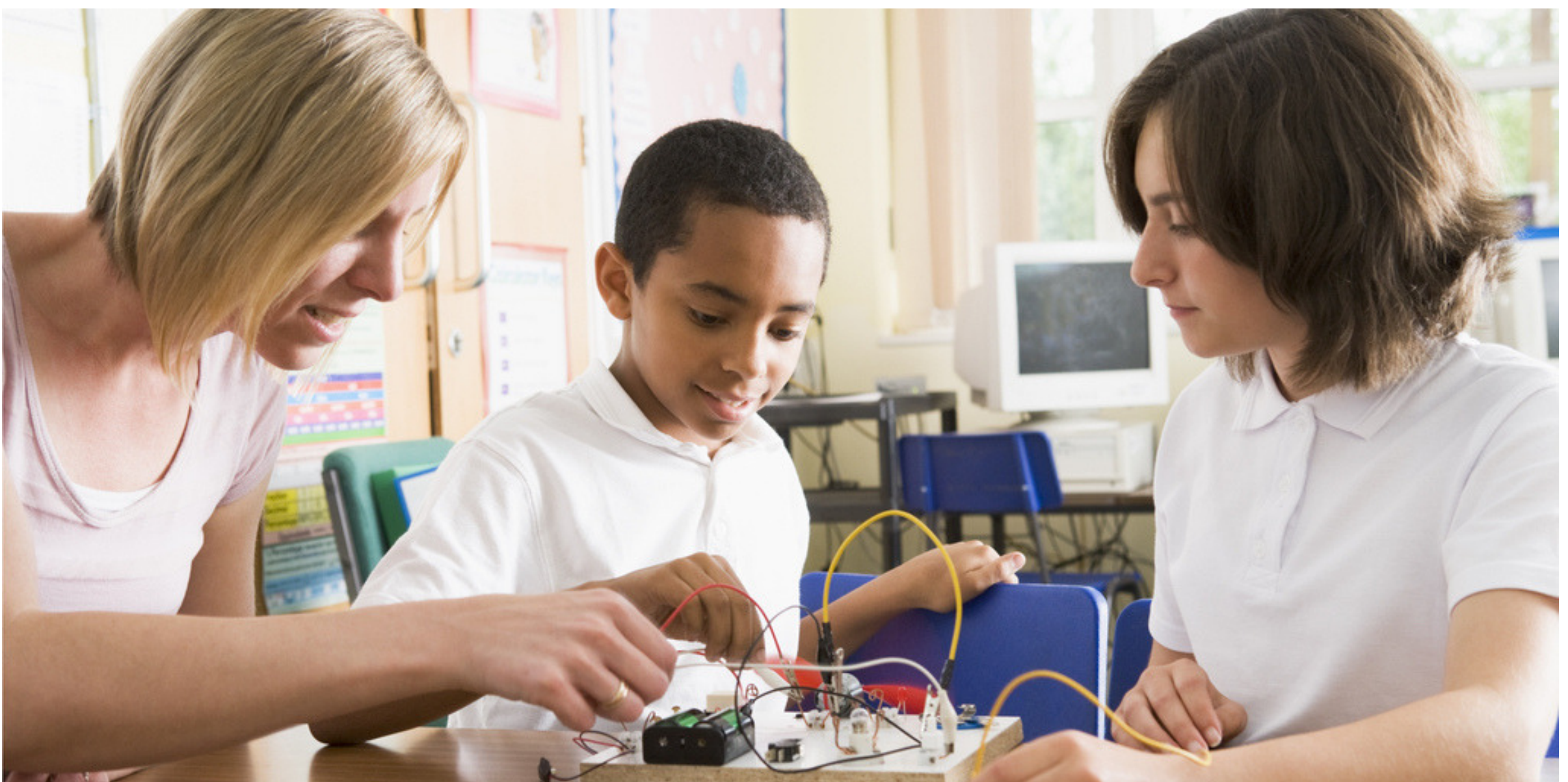
Project-Based Learning (PBL) is an instructional methodology that encourages students to learn and apply knowledge and skills through an engaging experience. PBL presents opportunities for deeper learning in-context and for the development of important skills tied to college and career readiness.

3 Characteristics of Project-Based Learning

Here are three characteristics of meaningful project-based learning activities that lead to a deeper student understanding:

1.) Interdisciplinary

PBL focuses on engaging students with real-world problems. This is an interdisciplinary approach, because real-world challenges are rarely solved using information or skills from a single subject area. Projects require students to engage in inquiry, solution building, and product construction to help address the real-world issue or challenge presented. As students do the work, they use content knowledge and skills from multiple academic domains to successfully complete the project.



2.) Rigorous

Project-based learning requires the application of knowledge and skills, not just recall and recognition. Unlike rote learning that assesses a single fact, PBL is more complex and can help assess how students apply a variety of academic content in new contexts. As students engage in the work of a project they follow a process that begins with inquiry. Inquiry leads to not just related to academic content but also related to the use of content in the real world applications. Inquiry processes can help lead to the development of solutions that address the problem/challenge of the project and the creation of products to communicate solutions to an audience based upon the application of content and skills.

3.) Student-centered

In PBL, the role of the teacher shifts from content-deliverer to facilitator/project manager. Students work more independently through the PBL process, with the teacher providing support only when needed. Students are encouraged to make their own decisions about how best to do their work and demonstrate their understanding. The PBL process fosters student independence, ownership of her/his work, and the development of 21st century/workplace skills.



Why Project-Based Learning?

Students must be prepared to meet the demands of a global society. Project-based learning supports 21st-century student learning outcomes. Students who learn through PBL are often more engaged in the learning process and develop a deeper understanding of the content and skills required for college, work, and life beyond school.

PBL helps build 21st-century skills students need to succeed. PBL is an effective platform for helping to develop students' capacity for critical thinking, communication, collaboration, and creativity, also known as the Four C's of 21st Century Learning. PBL integrates the “Four C’s” into classroom teaching and learning across a variety of grade levels and disciplines.

Research on the impact of PBL on Student Achievement

A report developed by MIDA Learning Technologies shows that students engaged in PBL understand concepts more deeply than those receiving traditional instruction, resulting in improved problem-solving skills. Past research reviewed in the report also suggests that PBL students perform better on a wide range of assessments including standardized testing. The [full report](#) includes quantitative and qualitative evaluations of students' problem-solving abilities after implementation of STEM centered PBL's in science class.

The study examined students in second and fifth grade, and took place during the 2015–2016 school year. Experimental classes were asked to implement the PBL model for the part of the school year, while the control group classes did not engage in PBL. The design of the study asked teachers to implement Defined STEM performance tasks in their science classes, and then looked at the transference of problem-solving abilities to the mathematics classroom.

Scores indicated that second-grade students exposed to PBL outperformed the corresponding control group by 49 percent. The fifth-grade group had similar results. In addition, teacher reflections in interviews and focus groups indicated that student enthusiasm, motivation, and engagement in the experimental classes were very high.

Both the quantitative and qualitative findings of this study are consistent with a growing body of research suggesting that project-based learning provides a deep, meaningful understanding of content by engaging students in a highly motivating learning environment. Students using PBL perform better on both standardized assessments and classroom summative assessments than students in traditional direct-instruction programs, and they learn essential life skills such as analytical thinking.

Chapter 2

Preparing Educators to Implement Project-Based Learning

For PBL to reach its full potential, educators must learn to step back and be facilitators in the classroom, a change that requires thoughtful and ongoing professional development.

Here, three educators offer their insights on what it takes to roll out and support a successful PBL implementation.

Dr. Art Fessler, Superintendent of Community Consolidated School District 59 in the Chicago suburbs, is devoted to ensuring his teachers receive relevant training and support.

To kick-off their training, Fessler's teachers made visits to local programs engaging in PBL and worked closely with their administration and coaches to help them identify a path to implementation and develop their own PBL opportunities. Fessler explains, "As we shift into a modern learning environment, I wanted to ensure educators had a shared understanding of what PBL looks like."

Fessler worked towards building teacher buy-in by allowing voice in the process and autonomy in the design. Their leadership team spent a significant amount of time discussing and building a shared understanding of best practices in instruction and leadership so leaders have the requisite skill to inspire and lead. Both building and district leaders were required to spend a portion of their day in the classroom and grade-level meetings to gain an understanding of the challenges staff face. Asking good questions, collecting data, and providing meaningful feedback all play an important role in building leadership credibility and empowerment.

They used multiple professional guidance materials and resources including the Buck Institute and [Defined STEM](#). While Buck Institute helped them kick-start their PBL program by providing educational blogs and actual units, Defined STEM's project-based learning resources saved them valuable time spent curriculum planning.

"We ensure every resource we provide allows teachers the flexibility to modify and really personalize lessons to meet the needs of their students and provide some level of choice in learning. The bottom line is that we provide educators the tools to make the learning applicable and engaging and to prepare our students to be successful in life. "

Dr. Joanne Mullane, Assistant Superintendent of Hopatcong Borough Schools in New Jersey, uses a hands-on training model to show teachers the power of PBL.

Knowing that many teachers had never engaged in PBL before, Mullane's set out to provide her educators with the support they needed to break away from traditional teaching models. "We asked ourselves, how do you teach educators to teach project-based learning? The answer we came up with was that you invite them to do it themselves."

All of Mullane's teachers went through hands-on training sessions. Using a train-the-trainer model, they created a handful of PBL experts who would facilitate training and implementation at each school. In the training, teachers were split into groups and completed a performance task just as students would. They conducted research and had to design, draw, and present their projects.



Working through a task allowed teachers to experience how performance tasks increase student engagement and allow students to use their knowledge to discover solutions and answers for themselves. They were no longer providing answers to students, but were facilitators of the classroom, guiding them to explore a new style of learning.

During the first year of the implementation, each building had the freedom to implement PBL in their own way, but all teachers were required to do at least one performance task with their students. For example, their 4th- and 5th-grade building implemented PBL by grade level, so 4th-grade students worked on one cross-curricular project in all classes showing them how math, science, english, and social studies are connected in the real world.

This approach was wildly successful for Hopatcong. At the end of the school year, they had a group of students present one of their projects to the school board to showcase their growth in all content areas. They also took time for teachers to showcase their student's work during a faculty gallery walk.

Teri Fleming, STEM Curriculum and Professional Development Director of Stoughton Public Schools, explains her preference to implement PBL in small steps.

Fleming states "Teachers have an overwhelming desire to provide students with the “correct” answers, which is a difficult hurdle for educators to overcome. Additionally, our students are not used to being “independent learners,” and are accustomed to seeking the correct answer instead of using their knowledge to problem solve for viable solutions. It’s my job to help educators feel comfortable and successful when implementing PBL, and support them in blending their role as teacher and facilitator."

Based on years of experience, Fleming found it’s best to break PBL implementation into three parts:

1. Plan for your goal;
2. Implement in small steps; and
3. Support as much as possible throughout.

Fleming explains that educators want to know what direction your district is heading, so planning goals and communicating with them is important. They need to understand where and how PBL fits into the current curriculum and how it aligns to the standards.



Fleming believes that it works well to roll out new concepts and tools in small groups, and have the group provide feedback before implementing to a larger cohort.

They conduct monthly, half-day release professional development. During the sessions, they focus on what they need to improve instruction and curriculum in order to improve student learning. "We increase our knowledge of current trends, assessment formats, and make adjustments to our classroom instruction, lessons, units, and assessments. We also bring in speakers/specialists in content areas to facilitate conversations and support the teachers as work is done."

Additionally, their middle and high school educators have weekly collaboration time to share best practices, and for training on any tools they use. Fleming checks in with staff on a regular basis to see what they need from her.

When teachers are running a project in their classroom, Fleming makes every attempt to get there to see how the students respond. This step provides the foundation for their discussions moving forward. Lastly, Fleming asks her teachers to share their experience including student work, highs, lows, and reflect on what changes they will make next time.



Chapter 3

Tips on Implementing PBL

Kelsey Bednar, educator and national trainer at Defined STEM, explains the elements that teachers should consider when incorporating PBL into their curriculum.

4 elements to consider when incorporating PBL in the classroom:

- 1.) Content Selection
- 2.) Student Mindset
- 3.) Inquiry
- 4.) Classroom Organization

1.) Content Selection

This is the most important consideration in the planning process. The challenge is to create and/or find projects or performance tasks that are authentic, connected to the real-world, interesting to your students and most importantly, tied to your curriculum. If you are interested in designing your own PBLs or performance tasks, there are many resources that can help you in this undertaking. [Jay McTighe's paper on Designing Authentic and Engaging Performance Tasks](#) is one I would recommend that helps explain what a well-designed performance task looks like and provides a template for designing your own.





Also, be sure to look around your community for inspiration on meaningful projects to engage your students that require the application of content knowledge and skills.

While designing your own tasks can be an exciting challenge, there can be pitfalls. One thing to watch out for is that sometimes, what seems like a very cool project or performance does not actually require students to deepen their learning related to academic content and skills. To help avoid this issue (and save tons of time!), consider using pre-made resources. There are multiple organizations which have created authentic PBLs/performance tasks that are tightly aligned to standards and provide a variety of support material as well. Two notable examples are the Buck Institute for Education's Project Search where you can search for PBL projects by source, content area, and grade band. [Defined STEM](#) is another great PBL resource with an online library of over 300 authentic performance and literacy tasks ranging across grades K – 12.

2.) Student Mindset

A roadblock that often appears when students experience PBL for the first time is the “Give us the right answer.” mentality. Your students may not have had opportunities to be creative and innovative without worrying about grades. Or, they may not have been previously able to cultivate grit or perseverance in an academic setting due to a variety of factors, like time.

3.) Inquiry

I have worked with teachers who were very excited about the possibilities of PBL in their classroom, but were hesitant to implement because their students “don’t know how to research”. They were understandably concerned about the amount of time it might take students to engage in the inquiry process– an important facet of PBL. To plan for a positive PBL experience, it is imperative to think through the inquiry process and how it might look with your students.

Reflect on your students’ prior inquiry experiences. Will they know how to develop research questions, gather information from credible sources or synthesize and interpret information? What will you need to do to scaffold that process?

Work collaboratively. Is it possible to team up with a colleague, perhaps from the English, Library or Technology departments? Doing this can help alleviate concerns over time and resources. It’s possible that students may be doing a task in science, but receive mini-lessons on research during their ELA time. Or, perhaps students’ library media or technology curriculum addresses how to use digital search tools responsibly so it would be natural to complete the necessary task research during that time instead of science time.



Consider available resources. What do you have access to in your building that can facilitate the inquiry process? Do your students have their own laptops or tablets? Can you reserve a technology cart for your class? Is there a computer lab available? If you do not have access to technology, think about how you will supplement with print resources or set specific parameters for the inquiry process that will allow students to successfully research within their means.

4.) Classroom Organization

The last element you should consider when planning for PBL this year is the physical organization of your classroom. There are some space configurations that lend themselves to student collaboration, communication, and creativity more than others. While it is likely that there are constraints on the way you are able to design your classroom, aiming to incorporate one or more of these changes can enhance students' PBL experiences:

Have materials available and within reach. Consider what materials you have available for students to work with and where they are located in the room. Are the materials organized and labeled? Are they within students' reach?



If your classroom has available technology, how can students access it? As PBL presents students with opportunities to apply their academic content in new ways, it will be critical that students understand what materials are available to aid this work and where to obtain them. Thinking about and preparing for this ahead of time will allow your students to problem solve and communicate more effectively during the year.

Ditch the desk. In a PBL classroom, students will be working on engaging, rigorous challenges and will need plenty of space that is designed for them to work together. Ask your principal if it would be possible to switch from desks to tables to encourage collaboration and communication. If this is not feasible, organize individual desks into groups so that they feel like tables. Get ideas on how to set up a learning space that supports PBL in [this inspiring video](#) by Apple Distinguished Educator and TED Innovative Educator, Anthony Johnson.

Create other spaces for collaboration. Regardless of if you have desks or tables, it is important to incorporate other spaces in the room where students can work in comfort. This might mean using carpet, bringing in bean bag chairs or perhaps cushions for the seats. While students may have to learn how to engage responsibly in these spaces, these setups can benefit creative and innovative thinking. If you do not have room to create inviting, comfortable spaces for students to work on the floor, consider if there is another space in your building where there is room to do so.

Project-Based Learning represents a shift in teaching and learning that helps our students develop a deep understanding and application of the 21st-century skills that can better prepare them for the demands of their futures. But this type of shift is one that must be carefully planned. When teachers consider the four elements of content selection, student mindset, inquiry, and classroom organization, they enhance the success of Project-Based Learning in their classrooms.



Here are tips for how you can ease students into PBL or performance task scenarios over time:

- Keep the first performance task simple.
- For an introductory experience, only ask students to create one product/ performance and select a task that requires the application of content and skills you know they have already mastered.
- Work together as a whole group on the first task of the year. From there, you can gradually release the responsibility and ownership of the learning to small groups by their 3rd or 4th experiences. This gives students time to observe and learn the processes and mindsets that will eventually allow them to tackle “messy” real-world problems independently.

By carefully selecting projects/performance tasks and planning for the reality of what your students’ mindsets may be, you will have already addressed half of the planning elements necessary to implement PBL.



Chapter 4

PBL In Action: Stories of Success

- Dr. Geneva Walters, the superintendent of Kankakee, IL School District, shares the success her schools have seen since transitioning to a career-focused PBL-model.

From the time a student walks through the door of a school in Kankakee School District to the time they walk across the stage to receive their high school diplomas, they are constantly transitioning to their next stage of life. Since I started in education, I've used the motto, "The transition to adulthood starts in preschool." Today, the phrase is the mantra pushing my teachers and principals to think past the traditional style of teaching and incorporate hands-on project-based learning that offers students a chance to explore a plethora of careers.

To help make all of our students aware of the career options available to them, in 2015 I created a virtual career wheel for Kankakee teachers to follow. Each grade focuses on a different segment of careers, so as students move through elementary school they are able to explore a variety of fields and recognize where their interests lie.

During the year, students do four hands-on, cross-curricular projects to further experience what it takes to work in a specific career. The projects make the career wheel come alive because students can apply their classroom knowledge and make connections to the real world. Kankakee's teachers use a web-based curriculum resource, Defined STEM, which provides hundreds of project-based lessons that are based on real-world problems in STEAM careers.



Since we implemented this PBL model, data shows that in one year (2016 to 2017), reading comprehension scores increased 8 percent, math application increased 9 percent, and math computation had a 42 percent increase. We have also seen an increase in student engagement in all of our K-6 classes, and have built partnerships with local businesses and industries that support students' exploration and curiosity about future career options.

[Click here](#) to view the career wheel used in the Kankakee School District 111.

- Anthony Johnson, science teacher and SW Regional Teacher of the Year and TED-Ed Innovative Educator, explains how he uses PBL to bring the real-world to his classroom.

I adopted a project-based model in my first year of teaching. On the first day of school, I issue my students a PASSPORT (which stands for “Preparing All Students for Success by Participating in an Ongoing Real-world simulation using Technology) and explained that their yearlong simulation in “Johnsonville” starts today.

The school year is a simulation of adulthood where students work, create, and learn about personal finance and entrepreneurial skills. They experience real-world situations and gain insights into global affairs. Students don’t view my classroom as a “classroom” but more of an interactive city where all projects intertwine to create an ecosystem of businesses, homes, and more.

Each student has the opportunity to become an entrepreneur, politician, banker, and more. They are given \$1,000 in Johnsonville cash to begin their lives. Students must buy a house or rent an apartment, earn wages, and manage their finances. As the children buy and sell items that I donate, they learn math skills along with life lessons.

Like a real business, they manage a database of their clients or suppliers, create advertising plans, and track their income to ensure they are making a profit. Students earn extra money through academic achievements and good behavior.

I use Defined STEM, an online K-12 PBL resource, to help me create relevant lessons I can incorporate into Johnsonville. The supplementary curriculum provides students with research resources, videos, and project prompts that test students to think outside the box and put them in real-world situations.

Here are 3 Tactical Classroom Tips for Creating a Johnsonville-Like Environment:

1.) Make project-based learning relevant to the students. In Johnsonville, students are exploring issues like buying a home, paying rent, starting a business, and managing finances. Students see adults face these same issues and can relate what happens in Johnsonville to the real world, making every lesson relevant and gets them excited to learn.

2.) Encourage collaboration. Desks are designed for individual students—which is why I don't have any. In my classroom you will only find tables, collaboration bars, and sofas perfect for students to think creatively and problem-solve in groups.



3.) **Facilitate.** Other teachers trying PBL often tell me, “my kids can’t do it” or “it’s a lot of work.” However, I think the real issue is teachers giving up control of their classroom. PBL allows students to take charge of their learning, which gives the educator freedom to facilitate and encourage critical thinking.

North Carolina State testing proves that my PBL model improved student scores. At the end of the 2016 school year, my 5th-grade students scored an average of 85% on the state science exam, while my school as a whole scored 58%. I believe my focus on PBL and hands-on learning propelled my students and was the catalyst for this major boost in test scores.

For more inspiring articles on project-based learning written by educators for educators, visit the [Defined STEM blog](#).

"When students become part of their own learning they take pride in their education and become more engaged. Project-based learning keeps students busy and allows each one to show what they've learned in a creative, supportive, and collaborative environment."

- Anthony Johnson, NC SW Regional & RSS District Teacher of the Year and TED-Ed Innovative Educator



Looking to get started with project-based lessons, but don't have time to design them?

Get access to hundreds of engaging standards-aligned project-based lessons at www.DefinedSTEM.com.

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