Project-Based Learning for the 21st Century: Skills for the Future

Stephanie Bell

Project-Based Learning for the 21st Century: Skills for the Future

STEPHANIE BELL

Abstract: Project-Based Learning (PBL) is an innovative approach to learning that teaches a multitude of strategies critical for success in the twenty-first century. Students drive their own learning through inquiry, as well as work collaboratively to research and create projects that reflect their knowledge. From gleaning new, viable technology skills, to becoming proficient communicators and advanced problem solvers, students benefit from this approach to instruction.

Keywords: project-based learning, 21st Century skills, inquiry, authentic learning, motivation, creativity

Mrs. Regent was erasing the board, getting prepared for the next lesson, when the new assistant principal walked in. Introductions were made as the assistant principal perused the room. He stood for a minute or two, just looking at the classroom. Finally, he spoke. "They are all so... engaged," he said with astonishment. The teacher paused for a moment, not sure what to say. She looked around, and it was evident that each child was immersed and focused on his or her work. The only thing that the teacher could respond to the assistant principal was, "Aren't they supposed to be?"

"Can I please do a project? I have an idea for an inquiry! Please? Please?" Have you ever heard a child beg to do work? In a project-based learning classroom, it is routine!

An Introduction to the Project-Based Learning Approach

Project-Based Learning (PBL) is a student-driven, teacher-facilitated approach to learning. Learners pursue knowledge by asking questions that have piqued their natural curiosity. The genesis of a project is an inquiry. Students develop a question and are guided through research under the teacher's supervision. Discoveries are illustrated by creating a project to share with a select audience. Organizers support systematization of the processes that will be implemented throughout the research and project phases of PBL. Student choice is a key element of this approach. Teachers oversee each step of the process and approve each choice before the student embarks in a direction. Children with similar inquiries may elect to work cooperatively, thereby nurturing twenty-first-century collaboration and communication skills and honoring students' individual learning styles or preferences. PBL is not a supplementary activity to support learning. It is the basis of the curriculum. Most projects include reading, writing, and mathematics by nature. Many inquiries are science-based or originate from current social problems. The outcome of PBL is greater understanding of a topic, deeper learning, higher-level reading, and increased motivation to learn.

PBL is a key strategy for creating independent thinkers and learners. Children solve real-world problems by designing their own inquiries, planning their learning, organizing their research, and implementing a multitude of learning strategies. Students flourish under this child-driven, motivating approach to learning and gain valuable skills that will build a strong foundation for their future in our global economy.

Research on PBL

Standardized testing is one measure of achievement. Each state has its own standard measure of academic competency. Each standardized test only measures the specific content knowledge it is designed to test. In measuring basic academic subject proficiency, standardized testing shows that students engaged in PBL outscore

---

Stephanie Bell is an elementary school teacher in Katonah, NY, and a doctoral student of Instructional Leadership at Western Connecticut State University, Danbury, CT.

their traditionally educated peers (Geier et al. 2008). However, standardized testing does not measure critical twenty-first-century skills that are integral for student success.

In one British study, over the course of three years, students were taught using traditional math programs at one school and PBL at another school. Three times as many PBL students achieved the highest possible grade on the national exam than the students at a traditional school. Students at the PBL school were equally able to answer procedural questions that used formulas, but they were superior in answering applied and conceptual problems (Boaler 1999). This researcher concluded that students acquired a different kind of knowledge from using a PBL approach.

In another study, elementary students in three Dubuque, Iowa schools that used PBL raised their IOWA Test of Basic Skills scores from "well below average" to the district average in two schools and to "well above the district average" in another school. Moreover, in three years, reading gains "ranged from 15% in one school to over 90% in the other two schools while the district average remained the same" (Thomas 2000).

At an inner city, racially diverse school in Boston that implemented a PBL program called Expeditionary Learning, eighth graders exhibited the second highest scores in the district on the Stanford 9 Open Ended Reading Assessment (Thomas 2000). Similar findings in Maine concluded that a middle school using a PBL approach showed significant increases in all achievement areas on the Maine Educational Assessment Battery after only one year using the approach. The gains made by this school were three to ten times higher than the state average (Thomas 2000).

Authentic projects require different measures of success, however. In PBL, students solve real-world problems. For example, in one study, students were asked to apply the concepts of geometry to architecture and submit designs for a new playhouse for a community center. Upon evaluating these designs, 84 percent of the submissions were judged to be accurate enough to build. This is an impressive measure of achievement. Moreover, students were able to revise their designs after consulting resources, which demonstrates a high level of motivation that is uncommon in traditional learning settings. Furthermore, these students demonstrated a solid grasp of the concepts and were able to perform well on traditional tests (Thomas 2000).

Learning to be Self-Reliant through Planning and Organization

There are several phases within PBL. Each phase must be completed in a timely manner. Thorough and careful planning is essential to the flow of the project and the success of the student. In the beginning, children use organizers to isolate an inquiry question. They then brainstorm what their procedure will be for research and identify the materials that they will need to do their research. Next, students select a way to display what they have learned in the form of a project. A target audience with whom to share their project is selected, ranging from their peers, to the principal, to their parents. The audience must be authentic and appropriate. For example, if students are working on a science inquiry on the topic of energy, they may choose to research how to harness hydropower to make a machine. A group may elect to make a working catapult. The culmination of the project might be a contest to see how far they can catapult a ball or an egg, with the class as the audience. Accountability to an audience coupled with a due date keeps students on track.

Learning responsibility, independence, and discipline are three outcomes of PBL. The organizational blueprint that students have designed for themselves guides them and allows them to stay focused and on-task. As children become more proficient in the PBL approach, they learn to self-monitor their progress through daily agenda setting. At the end of each work session, students report on whether they have met their goals for the day. Students must use their work time effectively and stay focused and on-task to succeed. Goal setting helps students learn to manage their own time. It is important for the teacher to confer with students regularly to ensure that students are on track and developing their ideas and skills fully. These skills are critical for future success in both school and life.

Students learn accountability with PBL through the daily goal setting, as well as through expectations of their peers. When students work collaboratively, there is an expectation that each child will contribute to the project equally. The group dynamic creates an interdependent team in which students must each do their part, and as a result, a natural consequence exists for those students who do not demonstrate accountability—others may no longer want to be paired with students who do not do their fair share. Therefore, peer pressure contributes to the accomplishment of ongoing group tasks throughout the learning process and the culmination of a successful final product. Students are conscientious because they must complete their project in the allotted time. They can be incredibly resourceful when time is of the essence. Accountability to peers often has greater consequences and provides more motivation for students than if they were only responsible to the teacher. Children do not want to let their friends down.

Social Learning Enhances Collaboration Skills

PBL promotes social learning as children practice and become proficient with the twenty-first-century skills of communication, negotiation, and collaboration. As children work on these projects, they must brainstorm ideas and act as good listeners to their group

members. Teaching students active listening skills enhances collaborative ability as well as creativity. Students learn the fundamental skills of productive communication, respect for others, and teamwork while generating ideas together. Negotiating how to collectively solve a problem is also part of PBL.

At the end of the project, students do a self-evaluation. They evaluate not only their learning, but also the success of their social interactions. They reflect on their communication skills, if they felt they listened well to other students' ideas, and if they believed their own opinions were heard. Consistent employment and practice of these skills will strengthen them over time and lead to proficiency and mastery. These skills are critical to future success in the structures of our global economy.

Differentiation Provides Intrinsic Motivation

The element of choice is crucial for students' success. Differentiation allows students to develop their own interests and pursue deeper learning. It also allows students to soar and learn at their own levels. Students use resources that are appropriate for their individual reading levels and compatible with their technology knowledge. One exciting feature provided by this intrinsic motivation is that students will often reach higher and attempt to read more challenging material to glean the information they seek. It is not unrealistic to suspect that students who are highly motivated will improve their reading abilities as they strive to understand and learn during PBL. Doppelt (2003), contends that students' "motivation to learn their discipline and their willingness to work on their projects [for] longer hours indicate that they behave. . . like high achievers" (p. 264). In another study, attendance was found to be higher in PBL schools (Thomas 2000). These behaviors have positive effects on learning.

The active learning process of PBL takes students' various learning styles and preferences into account. Students use a range of tools and resources to conduct their research. They also choose individual ways to demonstrate their learning in their final product. A child who prefers to be reflective may journal his learning in a diary format to share with peers. Others can read the diary and then write responses. A student who thinks in more of an analytic, mathematical way may elect to create a timeline of events or graph findings to present to his or her audience. Students also may select their preferred learning environment. Students may choose to work in a quiet library or a bustling hallway, lying down in the carpet area or sequestered in the cubby area. Children learn so much about themselves when they are empowered to make their own learning decisions. Children will reflect on these choices to ensure they are making the best decisions possible. The opportunity to make mistakes is part of the learning process. When we implement PBL, we allow children to discover who they are

as learners. They become able to make better choices, whether relating to process, environment, or outcome, which enables them to become more independent and responsible for their own learning.

Scaffolded instruction ensures success. *Scaffolded instruction* refers to the supports provided to students to assist them in making cognitive growth just beyond their reach. Students are involved in a discovery process when they first learn the structures of PBL, and they require much support and monitoring. Scaffolded instruction occurs in PBL when teachers use organizers that aid students in bridging the gaps that exists in knowledge and skill, and it makes the tasks manageable and achievable. As with most supports, scaffolds are temporary, and as the learner gains fluency in the skill, the supports are removed, leading to a self-confident and capable learner.

PBL in Action

PBL is an approach to instruction that teaches curriculum concepts through a project. The project is guided by an inquiry question that drives the research and allows students to apply their acquired knowledge. For example, as part of a middle school interdisciplinary study on Greece, students were instructed to choose a particular aspect of Greek life that interested them. Students chose one particular topic area, such as performing arts, visual arts, science, military, daily life, government, and so forth. After students selected a topic, they designed an independent inquiry. Each student researched independently and wrote an individual paper, and then some students worked in groups for the projects. Using their knowledge of Gardner's multiple intelligences (Gardner 2006), students created a three-minute presentation as part of a living museum on Greek life. Presentations included dramatic performances of the Battle of Marathon, debates on a Greek myth performed in character as Greek gods and goddesses in an Athenian courtroom, Greek dance, PowerPoint presentations, art, and more.

One student chose daily life as her topic. She designed an inquiry based on the oracle at Delphi. She and her teacher crafted an inquiry question together, gathered resources, and conferred regularly throughout her research and planning phases. The teacher took extensive notes of their conferences. These anecdotal records informed the teacher's instruction in guiding and keeping the student on track. They also served as a reference tool for a comprehensive final evaluation. Upon completing her research on the oracle at Delphi, the student wrote her paper. She then had to apply her knowledge through a project. For her presentation at the museum, she dressed up as the Pythia. When people visited her, she used the first-person point of view to first tell them about herself and then to tell her audience's fortune in true oracle fashion, cryptic and in riddles. The depth of her knowledge was evident in her performance. At

the end of the project, the teacher graded the student's proposal, research notes, work habits, presentation, and paper. The student completed a self-evaluation, as well as a project reflection. Responses about the process were overwhelmingly positive from both the students and teachers.

Technology Enhances Creativity within Parameters

In the twenty-first century, students use computers in very advanced ways, but we must remember that they are still children and need guidance to use technology safely and effectively. Technology as a means, not an end, enables students to experiment with different technologies for all aspects of PBL. An authentic use of technology is highly engaging to students, because it taps into their fluency with computers. Students participate in research using the Internet. During this phase of PBL, students learn how to navigate the Internet judiciously, as well as to discriminate between reliable and unreliable sources. It is important to set parameters to ensure that students can explore safely.

Students can use a multitude of applications, including Web 2.0, for their projects. Students may use a wiki to share knowledge or blog with other students to troubleshoot during the process segment of their projects. In the presentation phase, students may use various technologies to display their learning. Their audience may receive a podcast, a video, a photo story, a comic, and so forth. These uses of technology provide instruction to the student by demonstrating innovative usage of various applications. These applications also help students realize appropriate ways to use technology. When students share their work or challenges, a brainstorming session often helps them build on each other's ideas for future possibilities. This exercise promotes serious creativity and out-of-the-box thinking.

Real-World Connections

Research supports PBL as a tool to engage students in real-world tasks. Real-world tasks run the gamut in terms of necessary skills. It is important to remember that even though a project may be based in one curricular area, it crosses over into all areas of traditional academic studies. Evidence exists that through PBL, students become better researchers, problem solvers, and higher-order thinkers (Gultekin 2005). Research supports that students using PBL perform better on both standardized assessments and project tests than students in traditional direct instruction programs, and that they learn not only real-world application of skills, but also analytic thinking (Boaler 1999). In Boaler's study of students using a project-based approach in mathematics, students were better able to see the application of their learning and less likely to view math as a set of isolated skills. Additionally, children instinctively reach

further when they are highly motivated and interested in their inquiry topic. Motivation is sustained through meaningful, real-world problems and projects.

Real-world projects deepen learning for students. After returning from a field trip to Washington, DC, where middle school students visited various monuments, students selected a social justice issue that they felt deserved a monument. One student selected child labor laws. The student researched the topic and then designed a three-dimensional playground, with each play area representing a different aspect of the issue, to commemorate the laws.

The assistant principal in this case observed PBL in action and was amazed by the level of engagement. Students with strengths in academics were not the only ones who were successful. As the assistant principal carefully watched a special education student, he noted that the child was both determined and focused as he contributed to his project alongside his group members. This special needs student had an aptitude for construction on which the group capitalized in devising their project. Similarly, in the real world, people use their individual strengths and talents in their jobs.

Creating Success from the Beginning

In PBL, children are constructing knowledge and building on their background knowledge. Children retain more information when they learn by doing. Dewey proposed that learning by doing has great benefit in shaping students' learning. High-quality experiences, as well as continuity of experiences, are paramount. PBL is an effective approach and is in line with Dewey's philosophies, to which many educators have ascribed for enriched learning (Dewey 1938).

The PBL approach has been implemented with success as early as preschool using the Reggio Emilia approach. Reggio Emiglia is a project-based learning approach that began in northern Italy. It is a child-centered approach where the children are encouraged to pursue their natural curiosity. The discover through experiences that are carefully documented. Teachers guide students and are resources to students throughout their studies. Students learn through collaboration and employ critical thinking skills as they engage in projects. In particular, preschool students are encouraged to explore, investigate, and experience. This is the jumping-off point to developing students' love of learning and nurturing their natural curiosity. The beginning of PBL occurs when students learn in a social environment, work hand-in-hand with their teachers to discover ideas through careful scaffolding, document their journey of learning, and finally present their learning through projects. Beginning this approach early leads to greater success, because it hones the essential skills necessary

for the twenty-first century. The earlier we begin implementing this approach, the more competent children will be with the processes of PBL and implementation of skills. Research also supports that PBL is a highly engaging and motivating approach that draws more involvement, interest, and investment in learning from students. PBL raises students self-esteem by beginning the cycle of success (Doppelt 2003).

Measuring Effectiveness of Project-Based Learning

Our students develop twenty-first-century skills through PBL that will aid them in becoming productive members of a global society. Many of these skills are not measureable through standardized tests. We must shift our thinking about assessment when teaching twenty-first-century skills. With PBL, assessment is authentic. We measure a child's performance via rubrics, but a critical aspect of this model includes self-evaluation and reflection. Children learn from their processes. They reflect on how well they worked in a collaborative group and how well they contributed, negotiated, listened, and welcomed other group members' ideas. Students also self-evaluate their own projects, efforts, motivations, interests, and productivity levels. Students become critical friends by giving constructive feedback to each other, which helps them become aware of their own strengths and improve on their interactions with each other.

In the future, children must enter a workforce in which they will be judged on their performance. They will be evaluated not only on their outcomes, but also on their collaborative, negotiating, planning, and organizational skills. By implementing PBL, we are preparing our students to meet the twenty-first century with preparedness and a repertoire of skills they can use successfully. Moreover, PBL projects are often impressive, grand undertakings created and presented with ultimate pride and care.

As the assistant principal circulated around the room that day, he inquired of each student what they were doing, learning, researching, or making. Each student was on-task, thoroughly involved in a collaborative project, and able to explain to the assistant principal what they were engaged in at the moment, as well as what they had done and their next steps. Students articulated how they collaborated and problem-solved with their groups, and how they worked collectively to foster creativity and enhance their projects. When the assistant principal left the classroom that day, and for many months after that, the teacher was only more assured that PBL was the best approach for her students. A didactic approach kept students passive, but the engagement and enjoyment of students during PBL only heightened the teacher's conviction that she was imparting critical twenty-first-century skills to her pupils. What sealed the deal was the students' quick adaptation to the process and excitement about their learning. A big cheer rises from every student in the class when they hear that a new project will be beginning soon. That is what PBL is all about!

REFERENCES

Boaler, J. 1999. Mathematics for the moment, or the millennium? *Education Week* 17(29): 30–34.

Dewey, J. 1938. *Experience and education*. New York: Simon and Schuster.

Doppelt, Y. 2003. Implementing and assessment of PBL in a flexible environment. *International Journal of Technology and Design Education* 13:255–72.

Gardner, H. 2006. *Multiple intelligences*. New York: Basic.

Geier, R., P. C. Blumenfeld, R. W. Marx, J. S. Krajcik, E. Soloway, and J. Clay-Chambers. 2008. Standardized test outcomes for students engaged in inquiry-based curricula in the context of urban reform. *Journal of Research in Science Teaching* 45(8): 922–39.

Gultekin, M. 2005. The effect of project based learning on learning outcomes in the 5th grade social studies course in primary education. *Educational Sciences: Theory and Practice* 5(2): 548–56.

Thomas, J. W. 2000. A review of research on PBL. http://www.bobpearlman.org/BestPractices/PBL_Research.pdf (accessed February 28, 2009).