



## Project-Based Learning

*A dynamic approach to teaching in which students explore real-world problems and challenges, simultaneously developing 21st Century skills while working in small collaborative groups*

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## What is Project-Based Learning

Project Based Learning, or PBL, is an instructional approach built upon learning activities and real tasks that have brought challenges for students to solve. These activities generally reflect the types of learning and work people do in the everyday world outside the classroom. PBL is generally done by groups of students working together toward a common goal.

PBL teaches students not just content, but also important skills in ways students have to be able to function like adults in our society. These skills include communication and presentation skills, organization and time management skills, research and inquiry skills, self-assessment and reflection skills, group participation and leadership skills, and critical thinking.

Performance is assessed on an individual basis, and takes into account the quality of the product produced, the depth of content understanding demonstrated, and the contributions made to the ongoing process of project realization.

PBL allows students to reflect upon their own ideas and opinions, and make decisions that affect project outcomes and the learning process in general. The final product results in high-quality, authentic products and presentations.

## Why Use It?

- Puts students in a position to use the knowledge that they get.
- Effective in helping students understand, apply, and retain information.
- Can give students an opportunity to work with professional experts who enrich and support the teachers knowledge and how it connects to the real world
- can be more effective than traditional instruction, and increase academic achievement.
- benefits include building skills such as critical thinking, communication and collaboration.
- Students who work on projects show increased motivation and engagement in their studies.

## How is it Different?

Project-based instruction is innovative by its emphasis on cooperative learning. Additionally, students create tangible results to represent what they have learned.

Students use technology and inquiry to respond to a complex issue, problem or challenge. PBL focuses on student-centered inquiry and group learning with the teacher acting as a facilitator, as opposed to the one in charge.

Activities match as nearly as possible the real-world tasks of professionals in practice rather than classroom-based tasks. This encourages interdisciplinary perspectives and enable learners to play diverse roles and build expertise that is applicable beyond a single well-defined. Lastly, it allows a range and diversity of outcomes open to multiple solutions, rather than a single correct response obtained by the application of predefined rules and procedures.



## HOW IS PBL USED?

Some teachers use PBL extensively as their primary curriculum and instructional method. Others use PBL occasionally during a school year. Projects vary in length, from several days to several weeks or even a semester. PBL can be effective at all grade levels and subjects, as well as at afterschool and alternative programs.

How is PBL Used?

## Does PBL Work?

### DOES PBL WORK?

There is forty years of accumulated evidence that the instructional strategies and procedures that make up Project Based Learning are effective in building deep content understanding. Research also shows that PBL raises academic achievement and encourages student motivation to learn. Research studies have demonstrated that PBL can:



- Be more effective than traditional instruction in increasing academic achievement on annual state-administered assessment tests
- Be more resultant than traditional instruction for teaching mathematics, economics, science, social science, clinical medical skills, and for careers in the health occupations and teaching
- Be more practical than traditional instruction for long-term retention, skill development and satisfaction of students and teachers
- Be more serviceable than traditional instruction for preparing students to integrate and explain concepts
- Be especially effective with lower-achieving students
- Improve students' mastery of 21st-century skills, such as critical thinking, communication, collaboration, creativity and innovation
- Provide a fruitful model for whole school reform

As with any teaching method, PBL can be used effectively or ineffectively. At its best, PBL can be the spark in engaging learning experience and create a context for a powerful learning community to promoting achievement, self-mastery, and contribution to the community.



# Characteristics

PROJECT-BASED LEARNING VARIES FROM CLASSROOM TO CLASSROOM, BUT IS OFTEN CHARACTERIZED BY THE FOLLOWING ATTRIBUTES:

- Organized around a problem or challenge without a predetermined solution
- Creates a need to know of essential content and skills
- Students design the process for reaching a solution
- Requires critical thinking, problem solving, collaboration, and various forms of communication
- Provides the opportunity for students to examine the task from different perspectives using a variety of resources, separate relevant from irrelevant information, and manage the information they gather
- Students learn to work independently and take responsibility when they are asked to make choices
- Students regularly reflect on what they're doing
- A final product (not necessarily material) is produced and is evaluated for quality
- The classroom has an atmosphere that tolerates error and change
- The teacher takes on the role of a facilitator rather than a leader

The project-based learning approach creates a "constructivist" learning environment in which students construct their own knowledge. Whereas in the "old school" model the teacher was the task master, and in the "new school" model the teacher becomes the facilitator.

## **Students As Teachers**

## **Teachers as Coaches**

## **Parent and Community Involvement**

*"Project based learning allows many students to shine who might struggle on typical assessments."*

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### **Students As Teachers**

The age of the teacher as the primary fount of knowledge in the classroom is gone. Today, with the universe of experts and information available through the Internet, students can access new and relevant information not yet discovered by their teacher. Internet-using educators are discovering a new mode of learning that we call "Side-by-side learning." It is becoming a more and more common experience to find students assuming both informal and formal roles as teachers of their peers and younger students, and in many cases of teachers.

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### **Teachers As Coaches**

Teachers who involve their students in project-based learning activities also find their own role changing. Rather than being simple dispensers of knowledge, they discover their primary tasks are to guide and coach and mentor their students. They teach their students how to question, and how to develop hypotheses and strategies for locating information. They become co-learners as their students take on a variety of learning projects which could be unfamiliar territory. In the end, most teachers who experience this find it a rewarding experience.

When students can share their projects and activities with the "community" through their Web page presentations, or tangible results, they are not the only ones to benefit from the interaction with a larger audience. Teachers also make new peer connections, and find support and encouragement from a wide variety of their colleagues and content experts.

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### **Parent and Community Involvement**

With the growth of the Internet, more and more of "the community" can be found online, therefore allowing closer relationships between people inside schools and outside in the "real world". Parents, business leaders, scientists, and many other members of the community can play more effective and innovative roles as motivators, role models, sources of information, critics, evaluators, guides, and mentors.

The Internet also creates new model of school-community involvement. As students move from simply consuming, to producing and publishing new and original information and knowledge, members of the community seek out and appreciate the information presented on their Web site.

# **Changing Roles and Increasing Participation**



# Improved Learning Strategies and Thinking Skills

Learning To Learn

Life Long Learning

Active Learning

Cooperative Learning

## Learning To Learn

Effective online projects encourage students to work on a problem in depth, rather than covering many topics briefly. Students also engage in learning what is needed to solve a problem or complete a project, rather than when the teacher decides in predetermined curriculum. Both of these strategies are cited in educational reform literature as being important tools to improve learning.



## Life Long Learning

Web projects build learning experiences connected to the kind of learning one does throughout life, rather than only on "school" subjects. By using the real tools for intellectual work that are used in the workplace, rather than oversimplified textbook techniques, students become familiar with the kinds of knowledge that exist. Finding information and people on the Internet gives students the knowledge of how to go about acquiring the knowledge they may need.



## Active Learning

We all learn best by "doing." In a well-designed Web project, students work in a hands-on mode with the physical world. They gather information and data, explore, create, experiment, physically manipulate things, and organize information. They have access to people and information from the real world, and they develop a closer relationship to the real-world context of problems and projects. The connections to real people, events, and problems in the world brings a relevance and connection that is immediate and involves their interest, their intellect, and their participation.

## Cooperative Learning

Cooperative learning encourages active engagement by the students in learning, and it also builds critical skills needed in today's workplace. Online projects increase the audience and opportunity for cooperative learning by involving and communicating with a wide selection of people around the world. Students work directly with people from other places and cultures, and collaborate not only with peers, but with mentors and experts in a large number of fields.



# Examples of PBL in Mathematics

There is a wide variety of the type of project that teachers use in math class projects. Some teachers present a scenario for the project and have students take the role of a person in the workplace.

## STATISTICAL REPORT OF A STATE

In a middle school mathematics class, students work together preparing a statistical report on the state, choosing a topic such as education. The end product can be a presentation with graphs and written descriptions of significant findings. Consider collaborating with a language arts or social studies teacher for this project.

## DESIGN OF A SHOPPING MALL

In a high school geometry class, students work as architects and design a shopping mall. Students research the design of malls and the feasible sizes for various types of stores. The end product can be a brochure, poster, or webpage presenting the design to a panel of adults or students serving as a city-planning board.

## ROLE OF A HISTORIAN

In a high school algebra or trigonometry class, students take the role of historian by researching the life of a mathematician of the past. Students present an important contribution of the person in addition to his or her life story. The end product can be a PowerPoint presentation about the mathematician presented to interested students or adults.

## MULTIPLE PROOFS OF THE PYTHAGOREAN THEOREM

In an advanced high school mathematics class, students research various proofs of the Pythagorean Theorem. The end product can be a webpage showing the proofs or an oral presentation of one of the proofs.



# Project-Based Learning

## Work Cited/Resources/References

### **Computing Technology For Math Excellence**

<http://www.ct4me.net/index.htm> Online resources for teaching and learning mathematics (K-12 and calculus), technology integration, and the standards movement in education

### **Educational Technology Panel**

<http://www.ed.gov/offices/OERI/ORAD/Background> Background paper describing the Educational Technology Panel, originally established to identify, evaluate, and recommend exemplary educational technology programs

### **George Lucas Educational Foundation**

<http://www.edutopia.org/project-based-learning> Models of innovative practices in K-12 education which incorporate project-based learning

### **Project Approach**

<http://www.projectapproach.org> Project Approach theory, planning, examples, and professional development focused on using project-based learning in early childhood and elementary education

### **Project Based Learning Handbook**

[http://www.bie.org/about/what\\_is\\_pbl](http://www.bie.org/about/what_is_pbl) Buck Institute of Education's comprehensive overview of PBL

### **Project Based Learning Resources**

<http://www.earn-canada.org/sites.htm> Collection of resources related to project-based learning

### **Sharing Best Practices & Strategies in School Reform**

<http://www.bobpearlman.org/BestPractices/PBL.htm> Bob Pearlman's collection of PBL best practices, pilot projects, and student work

### **Technology Support for PBL**

<http://www.ed.gov/pubs/SER/Technology/ch8.html> Examples of technologies which provide support for the implementation of project-based learning

### **Virtual Architecture: Designing and Directing Curriculum-Based Telecomputing**

<http://virtual-architecture.wm.edu> Judi Harris presents examples of curriculum-based educational telecomputing projects and related resources

### **The Web Project**

<http://www.webproject.org> Focuses on innovative, project-based learning in the arts, humanities, and social sciences by people of all ages

### **WWWEDU Discussion List**

<http://www.globalschoolnet.org/gsntour> Pronounced "We Do" the WWWEDU listserv is one of the oldest gathering places for educators to exchange ideas about using the Web to support learning

### **WWW 4 Teachers**

<http://4teachers.org/tools> Online community for teachers integrating technology in the classroom; includes online tools, PBL checklist and other resources