Project-based learning

Project-based learning, or PBL, is a **collaborative education style facilitated by teachers, aimed at increasing student's retention of content in a way that is directly engaging, through projects applicable to life outside of the classroom.** Project Based Learning was promoted by the Buck Institute for Education in the late 1990s, in response to school reform efforts of that time. Project-based learning is an instructional method that provides students with **complex tasks based on challenging questions or problems that involve the students' problem solving, decision making, investigative skills, and reflection that includes teacher facilitation, but not direction**. PBL is focused on questions that drive students to encounter the central concepts and principles of a subject in a hands-on method. Students form their own investigation of a guiding question**, allowing students to develop valuable research skills as students engage in design, problem solving, decision making, and investigative activities**. Through Project-based learning, students learn from these experiences and apply them to the world outside their classroom. PBL emphasizes **creative thinking skills** by allowing students to find that there are many ways to solve a problem.

Structure

Project-based learning emphasizes learning activities that are **long-term, interdisciplinary and student-centered**. Unlike traditional, teacher-led classroom activities, students often must organize their own work and manage their own time in a project-based class. Project-based instruction differs from traditional inquiry by its emphasis on students' collaborative or individual artifact construction to represent what is being learned.

Elements

The core idea of project-based learning is that **real-world problems capture students' interest and provoke serious thinking as the students acquire and apply new knowledge in a problem-solving context**. The teacher plays the role of facilitator, working with students to frame worthwhile questions, structuring meaningful tasks, coaching both knowledge development and social skills, and carefully assessing what students have learned from the experience. Typical projects present a problem to solve (What is the best way to reduce the pollution in the schoolyard pond?) or a phenomenon to investigate (What causes rain?).

Comprehensive Project-based Learning:

- is organized around an open-ended driving question or challenge.
- creates a need to know essential content and skills.
- requires inquiry to learn and/or create something new.
- **requires critical thinking, problem solving, collaboration, and various forms of communication, often known as "21st Century Skills."**
- allows some degree of student voice and choice.
- incorporates feedback and revision.
- results in a publicly presented product or performance.

Examples

Although projects are the primary vehicle for instruction in project-based learning, there are no commonly shared criteria for what constitutes an acceptable project. Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content and structure of the activity, and guidance from the teacher. The role of projects in the overall curriculum is also open to interpretation. Projects can guide the **entire curriculum** (more common in charter or other alternative schools) or **simply comprise of a few hands-on activities**. They might be multidisciplinary (more likely in elementary schools) or single-subject (commonly science and math). Some projects involve the whole class, while others are done in small groups or individually.

Roles

PBL relies on **learning groups**. Student groups determine their projects, in so doing, they engage student voice by encouraging students to take full responsibility for their learning. This is what makes PBL constructivist. Students work together to accomplish specific goals.

When students use technology as a tool to communicate with others, they take on an active role vs. a passive role of transmitting the information by a teacher, a book, or broadcast. The student is constantly making choices on how to obtain, display, or manipulate information. Technology makes it possible for students to think actively about the choices they make and execute. Every student has the opportunity to get involved either individually or as a group.

Instructor role in Project Based Learning is that of a facilitator. They do not relinquish control of the classroom or student learning but rather develop an atmosphere of shared responsibility. The Instructor must structure the proposed question/issue so as to direct the student's learning toward content-based materials. The instructor must regulate student success with intermittent, transitional goals to ensure student projects remain focused and students have a deep understanding of the concepts being investigated. It is important for teachers not to provide the students any answers because it defeats the learning and investigating process. Once the project is finished, the instructor provides the students with feedback that will help them strengthen their skills for their next project

Student role is to ask questions, build knowledge, and determine a real-world solution to the issue/question presented. Students must collaborate expanding their active listening skills and requiring them to engage in intelligent focused communication. Therefore, allowing them to think rationally on how to solve problems. PBL forces students to take ownership of their success.

Outcomes

More important than learning science, students need to learn to work in a community, thereby taking on social responsibilities. The most significant contributions of PBL have been in schools languishing in poverty stricken areas; when students take responsibility, or ownership, for their learning, their self-esteem soars. It also helps to create **better work habits and attitudes toward learning**. In standardized tests, languishing schools have been able to raise their testing grades a full level by implementing PBL. Although students do work in groups, they also become more independent because they are receiving little instruction from the

teacher. With Project-Based Learning students also learn skills that are essential in higher education. The students learn more than just finding answers, PBL allows them to expand their minds and think beyond what they normally would. Students have to find answers to questions and combine them using **critically thinking skills** to come up with answers.

PBL is significant to the study of (mis-)conceptions; local concepts and childhood intuitions that are hard to replace with conventional classroom lessons. In PBL, project science *is* the community culture; the student groups themselves resolve their understandings of phenomena with their own knowledge building. Technology allows them to search in more useful ways, along with getting more rapid results.

Opponents of Project Based Learning warn against negative outcomes primarily in projects that become unfocused and tangential arguing that underdeveloped lessons can result in the wasting of precious class time. No one teaching method has been proven more effective than another. Opponents suggest that narratives and presentation of anecdotal evidence included in lecture-style instruction can convey the same knowledge in less class time. Given that disadvantaged students generally have fewer opportunities to learn academic content outside of school, wasted class time due to an unfocused lesson presents a particular problem. Instructors can be deluded into thinking that as long as a student is engaged and doing, they are learning. Ultimately it is cognitive activity that determines the success of a lesson. If the project does not remain on task and content driven the student will not be successful in learning the material. The lesson will be ineffective. A source of difficulty for teachers includes, "Keeping these complex projects on track while attending to students' individual learning needs requires artful teaching, as well as industrial-strength project management."Like any approach, Project Based Learning is only beneficial when applied successfully.

Problem-based learning is a similar pedagogic approach, however, problem-based approaches structure students' activities more by asking them to solve specific (open-ended) problems rather than relying on students to come up with their own problems in the course of completing a project.

A meta-analysis conducted by Purdue University found that when implemented well, PBL can increase long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.

Criticism

One concern is that PBL may be inappropriate in mathematics, the reason being that mathematics is primarily skill-based at the elementary level. Transforming the curriculum into an over-reaching project or series of projects does not allow for the necessary practice at particular mathematical skills. For instance, factoring quadratic equations in elementary algebra is something that requires extensive practice.

On the other hand, a teacher could integrate a PBL approach into the standard curriculum, helping the students see some broader contexts where abstract quadratic equations may apply. For example, Newton's law implies that tossed objects follow a parabolic path, and the roots of the corresponding equation correspond to the starting and ending locations of the object.

Another criticism of PBL is that measures that are stated as reasons for its success are not measurable using standard measurement tools, and rely on subjective rubrics for assessing results.

In PBL there is also a certain tendency for the creation of the final product of the project to become the driving force in classroom activities. When this happens, the project can lose its content focus and be ineffective in helping students learn certain concepts and skills. For example, academic projects that culminate in an artistic display or exhibit may place more emphasis on the artistic processes involved in creating the display than on the academic content that the project is meant to help students learn.