Abstract

This workshop will demonstrate a step by step procedure for conducting an investigation using technology in the classroom. This will help prepare teachers to meet national and state standards. Developing instructional technology skills to understand scientific concepts and doing investigation become the mandatory standard at both state and national levels. The Project Based Approach gives every student a chance to mimic what scientists do. It requires students to conduct research in the area they are interested in with the use of technology.

Introduction

Project Based Approach (PBA) is a versatile pedagogy that can be readily used in conjunction with other approaches. In this method the teacher poses a research question regarding commonly experienced local problems to guide the learning activities. Students work in teams and use learning technologies to investigate the question and design and present artifacts (e.g., Excel, Inspiration, audiovisual reports) addressing them.

The goal of PBA is for students to increase their knowledge and skills and develop appropriate disposition and feeling within a discipline or interdisciplinary content areas. According to Katz and Chard (1989) there are four categories of learning goals: knowledge, skills, disposition and feelings. Typically, formal instruction seeks to develop only knowledge and skills. Appropriate dispositions and feelings may also develop but only as by-products, as unintended consequences. PBA intentionally targets all four categories of learning goals, and especially emphasizes disposition and feelings. It is disposition and feelings that determine the learner’s motivation to make sense of the world.

By engaging in a project, students gain a high level of expertise in the specific area they are studying. The project can be challenging enough to require sustained effort over a considerable period of time. It is important, therefore, that the project problem is meaningful and keyed to Student’s interests. To ensure this, the problem is chosen by the students according to their interests and concerns. While the students work as a team, they assume individual responsibility for a specific part of the project and also for the final outcome, thus overcoming the “free rider” problem.

Rationale

The rationale for PBA is that people learn best through direct personal experience and by connecting new information to what they already know (Krajcik et al.,1993). Specifically, the approach addresses the ever-increasing interest in hands-on activities through which students will be able to discover a fact, a concept or a principle on their own. Secondly, the utilization of learning technology as an integral part of PBA aims at helping students to learn the optimal
exploitation of the World Wide Web, various soft wares (Excel, Inspiration, Image probe) for data generation and analysis. This also contributes to preparing students for the modern work environment.

**The Theoretical Basis of PBA**

The theoretical bases supporting PBA are pragmatism and constructivism. PBA, like pragmatism, emphasizes the experimental, interactive, and cooperative nature of learning. By requiring democratic group decision making, it enhances students' social and communication skills. This complements pragmatist's living learning views. Knowledge developed in such a manner would be expected to lead to personal growth. The guiding role of the teacher and student-centered learning in PBA are grounded in constructivism. In order to provide suggestions for problem solving and for shaping the learning experience itself, the teacher encourages the students to reflect on the process. It is now a well-established fact that each student brings a unique set of knowledge, skills, and experience to a new learning situation. Since the selection of the educational experience is guided by the student's concerns and interests, opportunity is created for knowledge creation from the interaction between the student's existing knowledge and the new experience (Airasian & Walsh, 1997).

PBA is centered in the theories of motivation, cooperative learning, and multiple intelligence, and in the inquiry method. It also emphasizes interdisciplinary projects.

**Motivation Theory**

A large body of literature has evolved related to the project based approach. Robert Karplus and his colleagues based the learning cycle format on Piaget's cognitive development principles, which provides a framework for the project-based approach (Trowbridge and Bybee, 1990). Cognitive psychologist Gagne (1984) suggested that long-term memory could be reinforced when a logical information process is utilized in the learning activity, as it is done in the project based approach.

According to Blumenfield et al. (1991) PBA enhances motivation and fosters cognitive engagement since students select and conduct the research on projects of their own interest and concern, which in turn should enable them to learn more and remember better, as compared to learning through didactic models.

**Cooperative Learning Theory**

Teamwork is an integral part of PBA. Each individual student is responsible for mastering one component of the project and, as a group member, is responsible to meet the group's goal by helping others. Such peer instruction is a common component of cooperative learning. In PBA the teacher creates a threat-free environment where students can increase their skills to effectively work with others. People become successful in solving complex tasks when they work in a team (Goldman 1995, Vygotsky 1960).

**Multiple Intelligence Theory**

Teamwork, essential to PBA, evokes the synergy of multiple intelligence. Howard Gardener (1993, Education leadership 1997) proposed a theory of intelligence that identifies eight
components of intelligence. He suggested that each person has some level of each of these eight intelligences. In PBA the teacher can use this idea to select a particular topic depending on the ability and interest of the students and create a team whose collective talents address most of the areas of intelligence that Gardener identifies. The teacher may compose the team on the basis of high level interest and talent of the students or can mix the team with high achievers and low achievers who can learn from each other.

**Inquiry Method**

PBA utilizes the inquiry method, which is more likely to enhance the student's investigative abilities than those methods reflected in traditional classrooms. (Basaga, Geban, & Tekkaya, 1994). This method engages students in conducting their own scientific investigative skill, collecting their own data, and analyzing them, thereby developing their thinking skills (Shepardson, 1997; Ertepinar and Geban, 1996; Lisowski and Disinger, 1991; Seymore et al., 1974). Emphasis is on developing a higher order understanding of the topic and the ideas being explored. Students are encouraged to develop curiosity as a habit of mind and to approach all learning with a disposition toward questioning and systematic investigation.

**Inter-disciplinary Area**

Carrying out complex interdisciplinary projects is an explicit component of the project based approach. The reasoning behind it is that real life problems are complex and that their solution requires insights from a variety of disciplines. One of the challenges of the interdisciplinary approach is that one person will rarely possess all the different kinds of knowledge. Teamwork comprising multiple intelligence and specific disciplinary members and cooperative learning will help inculcate in each student inter-disciplinary knowledge towards solving complex problems.

**Utilizing Software Tools in PBA**

The International Society for Technology in Education (1998) has developed National Educational Technology standards, which includes having students learn to use software tools throughout the curriculum. Using these standards, the expectation is that by the time students finish the seventh grade, they will develop a reasonable level of functionality in using a wide range of software tools, and teachers will be able to assume that their students are fluent in using the software tools. For example, in PBA the teachers enable the students to use Excel for representation of their data.

These student-generated data can then be shared and compared across the world through the internet. Such comparisons permit the students to develop an understanding of where they stand in relation to students in other schools, even in other countries.

**Implications**

There are three major areas of concern in the implementation of PBA. First, PBA classes are often noisy and free wheeling as the students feel free to share their ideas, frustrations, and excitement with one another. Neighboring classroom teachers may not appreciate this, and even the teacher conducting the PBA, unless properly trained in attitude and disposition, may feel a
lack of power and control. PBA thus may require administrative interventions to create a sense of support for PBA in the faculty. Secondly PBA calls for resources which many schools might find it hard to provide. The classrooms require a set up where the students can seat face to face to promote interaction. They demand material resources such as computers, different kind of software, and scientific instruments. PBA is time consuming and may experience conflicts with schedule especially the time pressure for covering required curricula and standardize tests. Finally, PBA is not appropriate for all students. They may not possess the initial disposition, motivation, or knowledge level to participate in the relatively unstructured environment of PBA. Such students require additional attention from teachers, school administrators, as well as parents to develop the characteristics necessary for PBA teaching and learning.

References


