Various Aspects of Problem Based Learning

Nuray Senemoglu, PhD
Professor in Curriculum & Instruction
Hacettepe University, Ankara/TURKEY

Why do we need to implement PBL or other effective teaching and learning approaches?

- "**Schools** are to their inhabitants **uninteresting**, **unstimulating**, **impersonal places** where respect for individuality is rarely found – or even possible. **Contex**t for **productive** learning **do not exist** for teachers, **teachers can not create** and sustain those context for students" (Sarason, 1998, p.13).

With implementing PBL

- "**We want children**, as a result of our teaching, **to understand**; to **be wise** as well as **well-informed**, able **to solve fresh problems** rather than have learnt the answers to old ones; indeed, **not only able to answer** questions but also **able to ask** them" (Britton, J., 1993).

In fact, educating children by using the **PBL approach** has a **tradition in American education**, and there are many examples of this approach all over the world.

- **This tradition** has focused on the importance of connecting **students' interests with real-world problems** they encounter, as John Dewey said.

According to Dewey,

- If experience is **educative**, it helps young people grow in **positive ways**;

In this case,

- **The task of the educator** is to match the needs and capacities of the learner with the subject matter in meaningful experiences. The subject areas of the curriculum should connect to ordinary "**life-experience**" and PBL does just that" (Kain, 2003).

For example,

- After establishing the Republic of Turkey, **Ataturk**, the first president of Turkey, invited **John Dewey to Turkey in 1924** to offer his expertise in establishing the Turkish educational system. Therefore, **progressivism** was implemented in the educational system.

Specifically, in the 1940's "**Teacher Training Institutes for Villages**" were established to prepare teachers to teach in the village schools.

- Children who had graduated from elementary schools in the villages were invited to attend these institutes.
- Education **in these institutes** was based mainly on **progressivism** (learning by doing and solving real–life problems), currently labeled PBL.

- **The curriculum was integrated**; an interdisciplinary approach was used to design the curriculum.
  - Curriculum included general art, fine arts (music, theater, dance, art), math, science, PE, vocational and professional education courses.
  - In math and science, the students planned the construction of some of their buildings by learning about angles, area, volume, strength, etc.
  - Math, physics, and chemistry problems came from construction, farming, sewing, cooking, home economics--that is, problems came from real-life.
  - **They planned and constructed some of their buildings, planted trees, and farmed.**
  - **They also communicated with and educated villagers by theatrical performances, folk dances, concerts, and home visits.**

- **Every weekend**, during the **weekly assessment meeting** with their teachers and administrators, students in these schools **reflected on their positive and negative experiences**, shared opinions, and **made recommendations** for the development of their education.
- Teachers and their administrators were **facilitators/coaches** while
- **Mainly students solved** the problems, and
- Active and **collaborative learning** was being practiced.

- Their professional courses dealing with teaching gradually increased during the 5 year-education period. **Field experiences** and **student teaching in the village schools** were important. Moreover, **they were assigned to their schools during the last semester** of their training. Thus, before graduating, the student teachers had become familiar with the schools in which they were going to teach.
- **Teacher candidates were educated as leaders and teachers of villagers in every field--** in agriculture, construction, electricity, carpentry, sewing, weaving, knitting, child development and home economics.

We can trace this concept of education back to **Socrates** (469-399 B. C.)

- He believed that self-education or self discovery was the only true way to learn.

In the late 1960s,

- Medical educators **at McMaster University** in Canada began using PBL to educate future physicians (Barrows, 1996; Kain, 2003; Athalye, 2006).

In 1980s

- Maastricht Faculty of Medicine (Netherlands) implemented PBL as the dominant educational strategy in medical education.
- Howard Barrows, one of the fathers of PBL, left McMaster and went to Medical School at Southern Illinois University and used great effort to adopt PBL methodology in many schools, universities and colleges.

- **The technique has been applied** to the education of architects, social workers, managers, economists, lawyers and educational administrators (Boud & Feletti, 1991; Bridges & Hallinger, 1995; Kain, 2003).

- **In mid 1990s**, in Turkey, this strategy has been mainly implemented in colleges of medicine, in-service teacher training, and in-service inspector training courses.

- **In recent years**, PBL has been promoted by a number of scholars and practitioners for use in public schools (Arends, 1997; Stephen, Senn & Stephen, 2000).

What is PBL?

- **PBL** is both a **curriculum** and a **process**.

  The curriculum consists of carefully selected and designed problems that demand from the learner acquisition of critical knowledge, problem solving proficiency, self-directed learning strategies, and team participation skills.

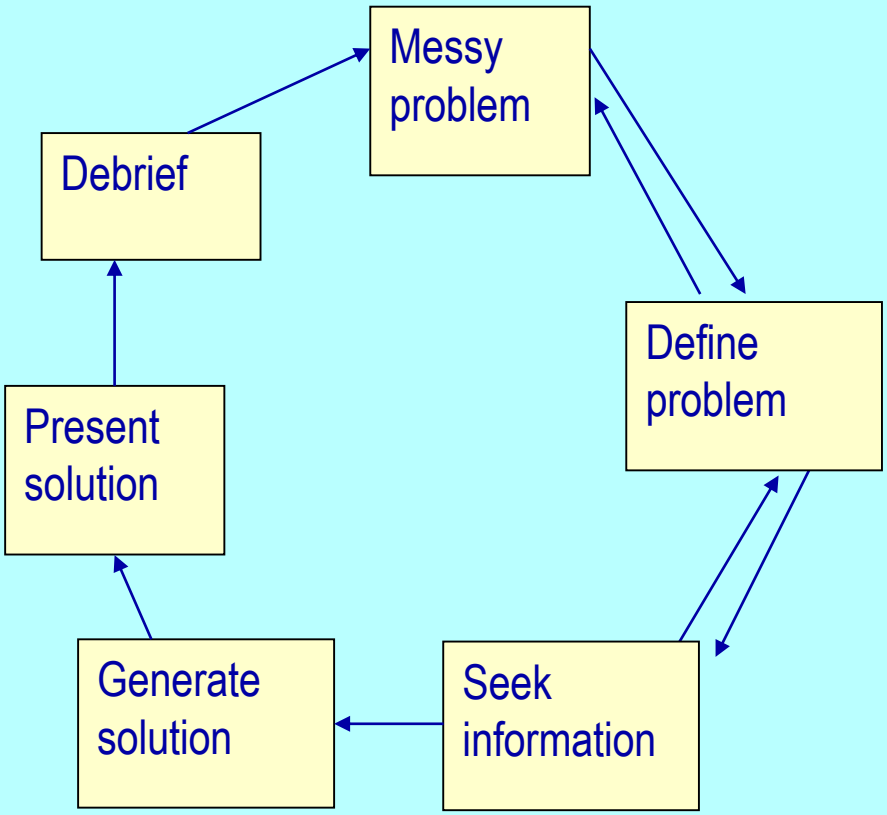
  The process replicates the commonly used systematic approach to resolving problems or meeting challenges that are encountered in life and career (Barrows, 1996).

- **PBL is an instructional method** that challenges students to "**learn to learn**" by working cooperatively in groups to seek solutions to real world problems. These problems are used to engage students' curiosity and initiate learning of the subject matter. PBL prepares students to **think critically** and **analytically**, and to **find and use appropriate learning resources** (Duch, 1995).

Characteristics of PBL

- PBL is organized around "**ill-structured**" problems: Ill-structured, complex **problems provide** the **focal point(s)** and **stimuli** for the course/curriculum and/or program.
- Learning is **student-centered**.
- Emphasis is on **integrative learning**

- **Students** work **in small groups** to solve, or provide multiple solutions to problems (Cooperative learning).
- **Faculty/** teacher acts as a **facilitator**/coach.
- **New information** can be gained from **self-directed** learning.
- **Learner assessment** is enhanced by **self** and **peer** assessment.



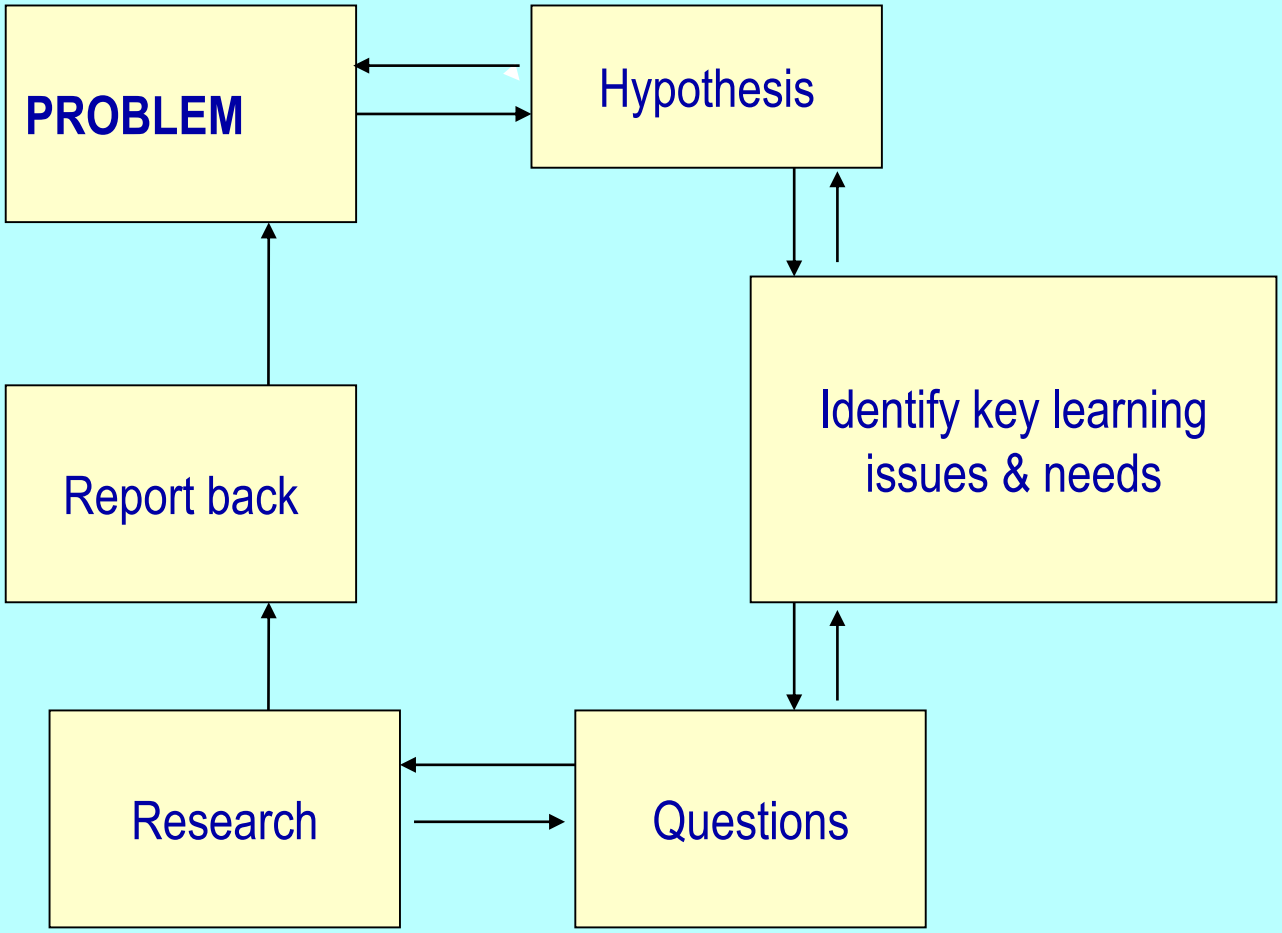
PROCESS OF PBL

- **What is the real problem?**

(List 2-3 options from role perspective)

- What do we know?
- What do we need to know?
- How can we find out?
- Now that we find out, what is the problem?

What do we know?...


PROBLEM
Hypothesis
Identify key learning issues & needs
Questions
Research
Report back

- “**The principal** of a middle school **expresses her frustration** with the way the students in her school **crowd** each other, **shove** in the hallways, and **make each other late for class**. It seems as though the halls have actually become hazardous, and some of the teachers are worried that there will be a major disaster soon. The principal considers this situation to be out of hand, and **she’s not going to put up with it** any more” (Kain, 2003).

The real problem is

- “Children in this school are rude and do not know how to behave. They probably should have classes in proper public behavior.
- The school is overcrowded. The school district needs to build another middle school to eliminate the problem.
- The locker arrangement is poorly designed. The principal should remove the lockers and replace them with smaller ones.
- The passing schedule puts all the students in the hall at the same time. A new schedule should be implemented that has kids going to their lockers at different times” (Kain, 2003).

Characteristics of a Good Problem

It must be

- relevant to students.
- “real” (plausible) vs. “contrived”.

It must have

- contextual details, but must call for more inquiry.
- multiple solutions should be possible (‘ill structured’).
- worthwhile embedded learning targets.

Role of Tutors/Teachers in PBL

- They are **facilitators**/coaches.
- They should follow **process guide** (3-stage structure: What do we know; what do we need to know; how can we find out).
- They **help students** learn to **ask metacognitive** questions ('why, how'; learn to learn).
- They **manage** student relations (assist).
- They should **help students** deal with learning issues (help focus as needed).
- They teach **study/**learning **skills** as needed (e.g. flow charts, matrix).

Benefits of PBL

- **Enhances** student motivation --fun for students and tutors, engages all students.
- **Improves** retention and application of knowledge and **lifelong skills** such as **problem solving** and **critical thinking**.
- **Generates** competencies- presentation skills, **working with a team**, time management, **confidence building**.
- **Encourages** students to **integrate** knowledge
- **Encourages** students to become responsible for **their own learning** and that of **others**; to become **self-regulated learners**.
- **Improves** students' **metacognitive** awareness.

- ***PBL helps students gain metacognitive knowledge and self-regulate own learning*** **(Metacognition:** knowledge about our own thinking process/ Knowledge about one's own cognitive system).

Variables of Metacognitive Knowledge

One's Own Knowledge about Her/His Learning Characteristics	*One's Knowledge about Learning Task/Subject-Matter*	*One's Knowledge about Learning Strategies*
One's own knowledge about herself/himself as a learner: The ability of learning specific task/ learning unit (i.e. concepts, facts, problem solving, psycho-motor skills), preferred learning styles, self-efficacy, motivation, attitudes towards and interest in learning task	One's knowledge about subject matter/task including difficulties of task for herself/himself	One's knowledge about what kinds of learning strategies are compatible with and effective in subjects/tasks for her/his active learning.

Some of the Research Results in PBL

- Students- school administrators- had superior **attitudes** and **application** of knowledge through PBL (Bridges, 1991).
- PBL improves the **diagnostic skills** of medical students (Schmidt et al., 1995), **and increases** students' ability **to retain and apply** knowledge (Albanese & Mitchell, 1993; Norman & Schmidt, 1992).

- **A longitudinal study** of students in the professions of **business**, ***marketing***, and **nursing** at Alverno College indicated that **PBL enhanced** the problem-solving skills graduates brought to their professions (O'Brien et al., 1991; Kain, 2003).

- **Meta analysis from 22 studies**, 14 institutions:
  - Better **satisfaction** and enjoyment **with PBL**
  - **No significant difference** in clinical knowledge or **test scores** (Catero & Carr, 2006).

Summary

- **Still** limited data
- **Needs** randomized and controlled trials
- **Reported satisfaction** with learning always higher **in PBL** studies
- **Higher costs/time** commitment with PBL

Arguments Against PBL

- **PBL is not suited** for everyone and all subject matter
- **PBL** necessitates **intensive** time and resources
- PBL does not possess role models
- Group process can be difficult
- Information overload may occur (Karra, 2006)

Some of the Problems and Solutions

- Dominant or Recessive Tutors
  - **In-service tutor training**

    -**Know** when to **intervene**, when to **back off**

    -Have more **involvement early**, then back off to allow student self regulation
- Group Dysfunction
  - **Use team building** techniques to **create positive group climate** and identity (especially at the beginning of grouping, implement icebreaker activities).
  - **Use cooperative learning assessment techniques** (individual assessment but group grading). **Therefore**, every group member will **have equal chance and responsibility** to contribute to group grade **in accordance with** her/his **own progress.**

For example:

We can define our criteria to assess students' progress and contribution to Group Grade:

Test Score	Points Earned Group
A perfect score (95 – 100)	30
10 or more points above BASE score	30
5 to 10 points above BASE score	20
4 points below to 4 points above BASE score	10
5 or more points below BASE score	0

Students	Base Score	Test Score after PBL	Points Earned Group
Mary	40	60	30
Bahar	90	95	30
Jack	85	90	20
Demir	76	80	10
Total group grade			**90/4=22.2**

21-30=A 11-20=B 0-10= C As a group every body gets 22.2= A

As seen in the above table, even the lowest achieving student contributed to group grade as much as the highest achiever did.