

What has problem-based learning (PBL) got to do with teacher education and training?

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Background information:

My journey from a science teacher.

Work with a school, needing to improve engagement in science and attainment.

How to accomplish this?

Research question/focus:

Focused on skills promoted by PBL among secondary school science students.

PBL

- ▶ PBL is extensively used in medicine (Barrows, 1996; Servant-Miklos, 2019) and other fields such as science and engineering are embracing it due to its impact on teaching and learning.

Despite its advantages, it is not widely used in teacher education.

PBL

- ▶ PBL in improving students' attainment
- ▶ The presentation importantly identifies those skills associated with PBL that teachers can promote among students.

PBL in teacher education

- ▶ teachers' pedagogical knowledge, the means to carry it out, and the time involved in planning a PBL
- ▶ creating a culture of collaboration and interdependence to scaffold students' learning
- ▶ Self-directed learning
- ▶ Self-directed learning and its impact on problem-solving have been contentiously debated, that PBL can be confusing for some students as they may not be used to this type of learning.
- ▶ Poorly planned PBL problems may affect the content coverage and activities required to promote problem-solving skills

PBL research

- ▶ The research was carried out in a co-education secondary school in England
- ▶ Data were collected through lesson observations, interviews, and focus groups. It was analysed using thematic analysis and the recurrent themes were coded by creating relationships and links to the problem-solving skills promoted by PBL.

PBL approach 1

- ▶ Barrow's (1986) ten steps to PBL:

encounter an ill-defined problem; have students ask questions about what is interesting, puzzling, or important to find out; pursue problem finding; map problem finding and prioritize a problem; investigate the problem; analyze results; reiterate learning; generate solutions and recommendations; communicate the results and conduct self-assessments.

PBL approach 2

► OECD's (2014) Programme for International Student Assessment (PISA) PBL framework:

Nature of the problem situation: an interactive process with some information given to students while they explore the problem situation.

Problem-solving process: exploring and understanding the information provided with the problem, representing, and formulating by constructing graphical, tabular, symbolic, or verbal representations of the problem situation and formulating hypotheses about the relevant factors and relationships between them.

Planning and executing: devising a plan by setting goals and sub-goals, and executing the sequential steps identified in the plan.

Monitoring and reflecting: involves monitoring progress, reacting to feedback, and reflecting on the solution.

Problem context: in what everyday scenario is the problem embedded such as social, personal, peers, family, and technology?

PBL- approach 3

- ▶ The 3C3R is a framework implemented through 9 steps design process. The 3C represents the core components responsible for developing content knowledge, contextualizing domain knowledge, and building a conceptual framework while the 3R represents the processing components such as researching, reasoning, and reflecting. This framework enhances self-directed learning

3C- content, context and connection

Students' content knowledge is a major limitation in adopting PBL.

Focus of the PBL

- ▶ Food and digestion topic
- ▶ Follow the 9-step process to design the PBL problems
- ▶ PBL problems- apply to real-life situations and vary in terms of cognitive challenge to promote problem-solving, students' interest, and engagement. This links to the 3C in the 3C3R model.
- ▶ The 3C helps in developing their content knowledge, context and making connections to the problems being explored.
- ▶ Students were presented with PBL problems and a set of success criteria.
- ▶ 3R process: researching phase and reasoning phase allow students to apply the knowledge gained from researching towards developing their problem-solving skills. Analyzing information, generating, and testing hypotheses. The third processing component, reflecting, helps optimize learning outcomes and promote problem-solving.

The problem

- ▶ Given the extended reports from Government, the media, and healthy eating experts, there have been concerns in the quality of nutritional value of food that students eat within and outside school. This poor diet has been reported as affecting students' health and learning. You have been recruited as a nutritionist or an expert to help students decide on a healthy and balanced diet required for good health. How would you solve this problem?
- ▶ Context of the problem: The students you will be helping are from one of the most deprived boroughs in London and most of them are on free school meals (FSM). On returning home after school, their parents could not afford to give them cooked meals despite knowing that fast foods may be unhealthy. How would you help the students to eat healthily?
- ▶ Depending on the year group, can provide sample questions to get them thinking through the process and then they explore the problems themselves.

Outcomes

Skills promoted through PBL:

Applying prior knowledge

Collaborative learning

Modelling/eliciting feedback

Each of the above has other qualities that describe them; however, they have in common knowledge acquisition, creation, and transfer (K-ACT) concepts; critical thinking skills and addressing misconceptions.

Recommendations

- ▶ The study suggests developing teachers' pedagogical knowledge to promote learning in this area.
- ▶ Using an established PBL framework would help novice teachers to develop problems that are worth solving
- ▶ Using a combined framework could be useful, however, may depend on the problem and the intended skills that you want to develop. If not, a framework can be enough.

What to think about

- ▶ A Harvard University study suggests that 85% of job success comes from having well-developed soft skills and people skills, while only 15% of job success comes from technical skills and knowledge (hard skills).
- ▶ Deloitte's research on Soft skills for business success- jobs will be soft skill intensive by 2030

Some soft skills: problem-solving, critical thinking, adaptability, creativity, teamwork.