EFFECTIVE TEACHING GUIDE: PROBLEM BASED LEARNING

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INTRODUCTION
This Effective Teaching Guide provides suggestions for Problem Based Learning. Problem-based learning (PBL) is a method of arranging learning around a central problem, situation or case study. In this method, the "problem" is presented as the first learning encounter and students then take charge of identifying what they need to know in order to solve the problem. Though lecturers usually provide some resources and reference lists, along with lectures, seminars or practicals relevant to the topic, students are responsible for seeking out learning (information, ideas and skills) required. PBL often utilises group work and peer teaching as part of its process.

The purpose of this guide is to provide assistance in developing and implementing PBL either as a smaller component of a non-PBL subject or as a way of organising curricula across an entire course.

DEFINITION
Common themes of PBL from research are:

1. The "problem" comes before the knowledge
2. Students identify what they need to know
3. Problems are often "real" world related
4. Problems have multiple possible solutions / avenues of enquiry.

Problem-based learning “revolves around a focal problem, group work, feedback, class discussion, skill development, and final reporting. The teacher organizes and pilots this cycle of activity, then teaches skills within that context. Inviting students into a learning experience that allows them to reckon it in their own terms, this technique provides the opportunity for active learning” (Burch, 1995).

In PBL, the problem drives the learning. Before students learn
some knowledge they are given a problem - the problem is posed so that the students discover that they need to learn some new knowledge before they can solve the problem" (Daniell & Hadgraft).

Woods explains that PBL is a way of “constructing and teaching courses using problems as the stimulus and focus for student activity. It is not simply the addition of problem-solving activities to otherwise discipline-centred curricula, but a way of conceiving of the curriculum which is centred around key problems in professional practice. Problem-based courses start with problems rather than with exposition of disciplinary knowledge. They move students towards the acquisition of knowledge and skills through a staged sequence of problems presented in context, together with associated learning materials and support from teachers" (Woods, 1996).

**PBL PROCESS: EXAMPLE 1**

A general structure for PBL involves the following steps:

1. Explore the problem, create hypotheses, identify issues. Elaborate.
2. What is the problem, the factors that are important, what is your hypothesis about what is happening?
3. Identify what you know already that is pertinent.
4. What do you know already?
5. Identify what you do not know.
6. What new information do you need to know?
7. As a group, prioritise the learning needs, set learning goals and objectives, and allocate resources.
8. Members identify which tasks they will do. Contract to teach each other.
10. Return to group, share the new knowledge effectively so that all the group learn the information.
11. Does everyone now know the key new knowledge?
12. Apply the knowledge to solve the problem.
13. Assess the new knowledge, the problem solution and the effectiveness of the process used.

From Woods, D. (1996) "Problem-based Learning: resources to gain the most from PBL."

**PBL PROCESS: EXAMPLE 2**

1. Goals meeting: Read problem statement, explore issues, prioritise, convert to learning objectives. Allocate learning tasks: discuss peer “teaching” expectations and format for
1. next session (1-1.5 hr).
2. Teach meeting: Each student returns to her/his group and teaches her/his topic (1-2 hr).
3. Feedback meeting: Each comes to meeting with a "good" 10 min test question based on the objectives from the Goals meeting. They provide an answer to their question. The group selects one question and, through the tutor, poses this to another group. In turn they receive a test question from another group. They have 30 mins to write out an answer to the question. Groups send representative to other groups to "mark" the answer. (1-2 hr).
4. Consolidate (preparation for peer teaching; mini subject peer-led tutorials): Offered in between group meetings; since all groups have the same core objectives, probably one person from each group has contracted to learn and teach subject "A" (for example, "interest and depreciation"). Bring members from different groups together who have the same topic. In this meeting they share with each the various resources they have found, compare interpretation and check they all understand the common subject. (1 & 2 hr).
5. Elaborate (after Feedback meeting): Once the group has completed the "problem", ask them to create another 10 problems that they could solve based on the same fundamental principles. Elaborate by looking for similar problems, ones that have similar symptoms but different solutions; ones that have different symptoms and similar solutions. (1 hr).

From Woods, D. (1996) "Problem-based Learning: resources to gain the most from PBL."

THE TUTOR'S ROLE

Implementing PBL requires facilitators/tutors to be skilled in the role of facilitation. The facilitator should not be seen as the group’s expert resource who will provide the answers, and it is not the opportunity for the facilitator to provide a lecture to students (Woods, 1996). Woods provides the following advice on the role of the facilitator in PBL. A facilitator brings out the best of the group by:

- “asking leading and open-ended questions, to help the students explore the richness of the situation and to help them develop their critical thinking;

- helping students reflect on the experiences they are having, because reflection develops professional skill (Schon, 1987); reflection improves problem solving (Kimbell et al., 1991) and elaboration and reflection improves the learning (Schmidt, 1983; Coles, 1991). These reflective skills are part of effective problem solving and group skills;

- monitoring progress, because successful problem solvers monitor their thought processes about once per minute to ensure that they are still on track and that they
understand where they are in the process (Schoenfeld, 1984). Monitoring is a key component in effective problem solving;

- challenging their thinking, so as to nurture deep learning and a search for meaning and so that they develop their critical thinking skills;

- raising issues that need to be considered, because groups without facilitators tend to identify about 60% of the teacher's intended goals (Dolmans et al., 1993);

- stimulating, encouraging and creating and maintaining a warm, safe atmosphere in which individuals will be willing to share experiences and ideas without fear of being ridiculed, because trust is the key ingredient to develop (Covey, 1989). Trust is nurtured by such an environment.”

From Woods, D. (1996) "Problem-based Learning: resources to gain the most from PBL".

ASKING OPEN-ENDED QUESTIONS

Some examples of open-ended and non-leading questions for facilitators is provided below. These questions have been adapted from Ambury, (1992) and Woods, (1995).

- What is the key information?
- What might be the causes / reasons?
- What questions do you have?
- What terminology / concepts are unfamiliar?
- Can you explain your reasoning?
- What do you need to know more about in order to address this issue/solve this problem?
- What are the normal levels?
- Why is this significant?
- What does it mean if it’s up by this amount?
- Hummm, or other such acknowledging noises
- I'm not sure that I follow you, would you mind repeating that so that I can understand your approach.
- Let's collect ideas about this
- Any other ideas?
- Are you sure? Can you check that?
- Why is that? How come?
- Why did you come to that conclusion?
- Do you agree with what was just said?
- If what you suggest is true, then how would you explain...
- For this situation, have you ever considered or thought about...
- Do you feel you need to look up that point?
- You seem unsure. Where could we find the information that would help you clarify this?
- Are there other ways to examine this problem?
• What are the assumptions being made? major? minor? hidden? flexible? questionable? Why did you study this? Why was this work done? Why in this context?
• How is this related to other information? Are there inconsistencies? How can they be reconciled?
• What are some concrete examples?
• So what? What can we do now that we couldn't do before?
• Where does the new information lead?

REFERENCES


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