Introduction to PBL: Problem Based learning

The PBL introduction consisted out of four steps. A first overview of the PBL method and an introduction to the seven "Maastricht" steps. The second part was a showing of a series of short introductory videos showing the PBL with a simple example. The third part was a short introduction to group behaviour and the final part was an example PBL session. The latter as specially chosen with a subject the students should be familiar with so they can see how a PBL cycle could have come to the same learning goals in a different and improved way. This is ended with a discussion about how the PBL cycle has worked.

Introduction

The problem based learning is shortly introduced via the description from 'The higher education academy' which can be downloaded from
http://www.physsci.heacademy.ac.uk/Publications/Primer/intrpbl4.pdf
   This is followed by three transparencies and an overview of the seven steps.

Problem Based Learning

We will try a new (for us) methodology

Problem Based Learning

- Group based

- It is not a group project (see below)

- Basic idea: get prepared for *life-long learning*

- Provides better motivation then traditional lectures

- It does not save time w.r.t. traditional lectures

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Problem Based Learning

- have a short story for a start

- use this to discuss and determine what should be learned

- go out and learn it

- Not a group project: everyone should learn everything

- find out what everyone has learned and evaluate

- repeat with new subject/story

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Problem Based Learning

Formalize into 7 steps after obtaining scenario/story:

1. Clarify terms and concepts not readily comprehensible.

2. Define the problem.

3. Analyse the problem.

4. Draw a systematic inventory of the explanations inferred from step 3.

5. Formulate learning objectives, followed by a few days of studies and work

6. Collect additional information outside the group and second meeting.

7. Synthesize and test the newly acquired information. A report is produced. The group evaluates how the work has gone and the meeting ends.

Step	Function	Role of the tutor
0. *Organise the group* Appoint a chairman(!) and secretary. These jobs should rotate.	Get to know each other, each person should introduce him/herself	
1. *Read the text out loud. Explain tems and concepts*	All particpants must have understood the starting point	If the group members do not succeed on their own, explain briefly terms and concepts. Make sure that everyone has understood
2. *Define phenomena, questions and/or problems that are present in the scenario.* Starts with e.g. putting down the facts and/or keywords, formulate problems as questions	All questions/facts mentioned by any group member must be along. This step is to focus the further discussion. Important that all agree and all understand why.	If needed, help students to have everything along and to obtain clean formulations that can stimulate *their* further discussion
3. *Analyse the problem (brainstorming)* Make an inventory of the group's first ideas that can be behind the facts/phenomena.	Activate existing knowledge. All ideas should still be kept at this stage. Important that *all* ideas are coming out.	Help to create an atmosphere where all dare to present their opinions/ideas/facts. See that all that is said appears on the blackboard. Use bodylanguage rather than speech.
4. *Put together the ideas that belong together and discuss them in depth.* Start to formulate proposals for explanations.	Organisation of existing knowledge. Develeopment of the group members knowledge structure. Discover and become aware of gaps in existing knowledge, differing opinions in the group and possible misunderstandings.	Help with formulating of ideas, help to summarize, stimulate discussion around different opinions, ask questions to stimulate deeper thinking, help test whether arguments are (well)-founded. Note: hypothesis from the group may be wrong but the intended learning outemes must be present.

Step	Function	Role of the tutor
5. *Formulate learning goals* The group must decide (together) what should be studied for the next meeting: everything what there was unclear, what there was disagreement about, etc.. Goals should be formulated as questions.	Group plans the learning that will happen. *Questions that test the hypothesis, what do we need to learn?*	Help to have the goals be relevant for what was studied (the scenario) and discussed, help to broaden or limit as necessary. Stimulate till deeper studies. Help to test relevance for the course goals.
Evaluation of the first meeting. Evaluate how the group has worked.	Improve the group's working and working climate. Increased attention on group work and the different roles.	Help the group with the evaluation with an emphasis on the process and group dynamics. Give your evaluation of the group and its members (*was everyone active? etc.*). Ask for evalaution of your own part.
6. *Individual studies.* Each student looks for additional informnation outside the group using sources as courseliterature, scientific articles, computer programs, external consulting (i.e. for us *lectures on demand*), etc	Learn how och where one searches for knowledge and information. Increas and structure your own knowledge base. Reflect on what one can and on what one has difficulties with.	Refer to possible good reference sources.

Step	Function	Role of the tutor
7. *Synthesize and check information.* Report on what has been acquired, discuss what was found, highlight the essential, structure the gained knowledge. Apply the gained knowledge to the starting point and see if it is now easier to understand and explain the phenomena. *Everyone should formulate his/her own thoughts, not one part each.*	Reorganisation and application of knowledge. Critical discussion of information and (value of) different sources. Evaluation of what you know yourself.	Ask for summaries, ask questions, make sure the blackboard is used, help in bringing out the essential, ask for applications, more extensive explanations, stimulate till evaluation of sources. Help with explanations if needed. Make sure that it does not become a series of mini-lectures but stimulate discussions. Help the students become aware of what they can and what they do not know. Stimulate a discussion about what the groupmembers have learned.
Evaluation after the second meeting. Evaluate the working of the group.	Increased attention to peronal learning. Improvement of the group's working.	Help the group with the evaluation with an emphasis on what the group has learned and its metacognition. Give response on what they have learned and how they have worked. Ask for response of your own role and activity.

Showing videos of a simple PBL example

The seven steps are introduced using the videos from Sematek Polytecnic in Singapore.
These can be downloaded from http://pbl.tp.edu.sg/PBL-Resources/Videos/videos.htm

The introduction and the several steps are explained in several short videos
http://ole-video.tp.edu.sg/ASFRoot/TCPBL/Facilitating/intro.wmv
http://ole-video.tp.edu.sg/ASFRoot/TCPBL/Facilitating/stage1.wmv
http://ole-video.tp.edu.sg/ASFRoot/TCPBL/Facilitating/Stage2.wmv
http://ole-video.tp.edu.sg/ASFRoot/TCPBL/facilitating/Stage3_5.wmv
http://ole-video.tp.edu.sg/ASFRoot/TCPBL/facilitating/Stage6.wmv
http://ole-video.tp.edu.sg/ASFRoot/TCPBL/facilitating/Stage7.wmv

Group dynamics

The following tables give some information on group dynamics. These tables are loosely adapted from "Group Dynamics for Teams," D. Levi, Sage publications Inc., 2001.

Stages of group development	
Forming	Orientation: members getting to know each other
Storming	Conflict: disagreement about roles and procedures
Norming	Structure: establishemnet of social relationships and rules
Performing	Work: main part, focus on completeing the task
Adjourning	Dissolution: Completion of task and end of the group

Norm issues for team meetings

Decisions	How should decisions be made? Must everyone agree for consensus? Does anyone have veto power?
Attendance	What are the allowed reasons for missing meetings? What should be done to encourage regular attendance?
Assignements	When task assignements are made, what should be done when team members do not do them or do them poorly?
Participation	What should be done to encourage everyone to take part?
Meeting times	When do meetings occur? How long should meetings be and how often should they happen?
Agenda and minutes	Who is responsible for these, distributes them, should they be public or restricted to the group?
Promptness	What should be done to encourage this?
Conversational courtesies	How can members be encouraged to listen attentively and respectfully to others? Are there rules needed to limit interruption or to prevent personal criticisms?
Enforcement	How should the team enforce its rules?

Types of group behaviour

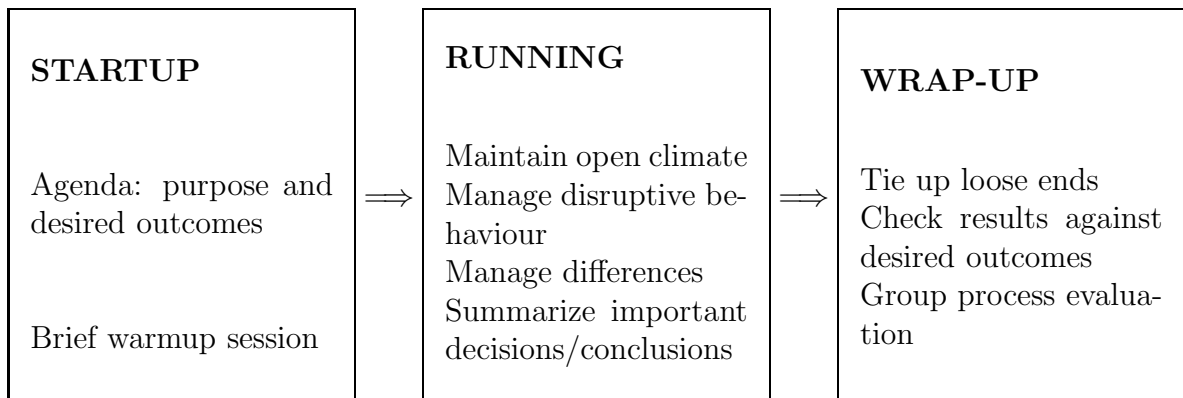| Behaviour	Function in the group
Task behaviours	
Initiator/contributor	Proposes new ideas or new ways for the group to act
Information giver	Provides facts and data for the decision making
Information seeker	Requests more information to help win the decision making
Opinion giver	Provides values, feelings and opions
Opinion seeker	Requests the opions of the others
Coordinator	Shows the relationships of ideas to organize the discussion
Energizer	Stimulates the group to continue
Critic/evaluator	Questions the group's ideas and procedures
Social behaviours	
Encourager	Rewards and supports others
Compromiser	Shifts members' position so as to reduce conflict
Harmonizer	Mediates conflicts between members
Expediter	Facilitates communication between others
Standard setter	Evaluates quality of the group's interactions
Follower	Accepts ideas of others
Group observer	Observes and comments on the group's progress/process

Types of social support provided by groups

Emotional	Rewarding and encouraging others. Listening to problems and sharing feelings
Informational	Giving ideas, advice and suggestions. Explaining and demonstrating how to perform a particular task
Task	Helping another with a task, providing supporting actions
Belonging	Expressing approval and acceptance, demonstrating belonging to the group

General overview of a team meeting: facilitation

STARTUP

Agenda: purpose and desired outcomes

Brief warmup session

$\Longrightarrow$

RUNNING

Maintain open climate
Manage disruptive behaviour
Manage differences
Summarize important decisions/conclusions

$\Longrightarrow$

WRAP-UP

Tie up loose ends
Check results against desired outcomes
Group process evaluation

A sample PBL problem

As a good introductory example we used the "Safe Policing" from Derek Raine, University of Leicester, available via http://wads.le.ac.uk/ph/leap/projectleap/index.asp and comes from procect LEAP.

The problem is about inelastic and elastic collisions. The students obtained the problem as stated below plus the information that it is part of a mechanics course. The main goal of this part is to show how the seven steps lead to obtaining the desired learning goals.

Safe Policing

Grabbit and Grubbit (Solicitors to the Common Man) Ltd are proposing to take a case to the European Court claiming that the use of rubber bullets is a violation of Human Rights. Their grounds are that, for the same mass and speed, the momentum in a rubber bullet is the same as that in a lead one. Thus they do the same damage on impact and are therefore equally likely to be lethal. How will you prepare a case for the Government's defence?