The Three-Step Cycle

Since PBL problems are intentionally ill-structured (students are not told what steps to carry through to solve the problem), the solution should not be immediately foreseeable. To solve the problem, students should be guided to use the three-step cycle consisting of: what we know, what we need to know and summary.

1. The first step a PBL group should adopt is to sift out what is important from what is superfluous in the problem and establish a list of facts. This first phase of the cycle is referred to as the "what we know" step, although only the selected important information known should be recorded.

2. Once students have established a list of facts, some information required to solve the problem will be missing. Therefore, students should use their list of facts to generate a second list of "what we need to know." Elements of this second list may be generated from a combination of elements of the first list (for instance, students may know the net force on an object and its acceleration, and use this to infer its mass, which in turn may be one of the missing elements required to solve the problem). This step thus requires students to collectively define the formal problem to be solved and determine what intermediate steps can be solved in order to achieve a global solution.

3. The last step allows students to monitor their progress and reshape their objectives from their current state of knowledge. Indeed, in the first step, relevant information is gathered. As a formal question is asked in the second step, some of the initially relevant information may have lost its importance. Therefore, one needs to return and summarize the current state of "what we know." The same review-summarizing process applies to the second step of the cycle. Indeed, some hypotheses of "what we need to know" may have been rejected and can therefore better orient "what we need to know" as well as "what we know." Therefore, this last "summary" step is the one that calls on the students to monitor their thinking by returning to the initial two steps of the cycle and re-evaluating "what they know" and "what they need to know." As new facts are generated, it is useful to make a summary (step 3, final step of the cycle) to manage the information flow.

For example, a car crash problem is given to students for them to learn about motion (1-D kinematics). The global problem is to find whether the driver was driving recklessly.

1. To achieve this goal, students will need to collect information about the context (what we know: definition of recklessness: driving under the influence, driving 30 km/h above the speed limit).

2. To determine whether the driver was reckless, more information is required, such as whether the driver was intoxicated or whether the driver was speeding (what we need to now: driver's blood alcohol level, driver's initial velocity).

3. As new bits of the puzzle are generated (e.g., information about substance use), a summary forces students to re-evaluate what they know and what they need to know (e.g., intoxication can now be declared or ruled out).

Note that, for students, the problem itself is meaningful (a car crash, just like on TV!), but ill-defined (what must I do to find out?). It is now up to the student to define the actual problem to solve (find the speed of the car on impact).