PBL

PROBLEM BASED LEARNING

REPORT FROM DISCUSSION GROUP ON PBL
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Introduction

The educational process involves information targeting the student. What we are looking for is the best possible way of accumulating the information and turning it into knowledge. Perceiving information is not enough. There must be a connection between the perceived info and a knowledge concept that will be more accessible and long lasting. The goal is the creation of knowledge. However the creation of actual knowledge is a process that takes place in the minds of the student. Thus, their active participation in the learning process is utterly important.
We acknowledge that tomorrow's engineers will be operating in an environment where information distilling is crucial, ant they should get the opportunity to develop skills in this area during their studies.

PBL

Definition

Problem Based Learning is a problem minded project oriented educational method that can appear both as an individual or a collective process. PBL involves increased student activity, and includes information seeking, sorting and utilising as well as problem solving.

Why PBL is needed

Because a student should be able to:

1. handle large amounts of information
2. work efficiently in a flexible working environment
3. communicate and cooperate efficiently on multi-disciplinary projects
4. develop long lasting knowledge
5. continuously adapt his way of thinking and learning
6. get a better view and complete understanding of the material received

Careful use of PBL

Careful examination is needed before PBL is applied. The first thing that needs to be taken into consideration is that not all courses are PBL friendly. Basic fundamental courses for example cannot find much practical use for a PBL based program. Basic Mathematics courses for once are found to be rather difficult to be approached in a typical problem based learning form. However it should be mentioned that the traditional way of teaching these courses should also be changed in such a way that the practical uses of the material handled become more evident. As a result the educational process for these theory-rich courses can become an insightful and more fulfilling experience. One way of doing that could be by altering the system with one final exam at the end of a semester. It would be far more motivating if there were credit based practical exercises during the whole semester that would lift some of the evaluation burden from the final exams.
PBL friendly courses can be found in later years when the taught material becomes more specialised and the project based learning is thus applied more easily.

PBL implementation

- Proper preparation important prior to project work
- Guidance necessary during the process
- Coordination and planning between professors of parallel courses needed
- Time-consuming projects are not necessarily efficient projects
- PBL methodology is dependant on the particular course

Lectures should be conducted before a project so that the student can have the opportunity to be properly introduced in the PBL formatted course. These introductory lectures will give the students the opportunity to obtain the necessary knowledge (basic theoretical foundations) that will prove invaluable during the flow of the course. Periodically programmed lectures can keep the student updated and well informed in a way that it will be easier to cope with any problems appearing in the meantime. Making sure that you are on the right track is equally important; therefore it becomes apparent that meetings should take place among the working-groups and the course organisers.

A problem with PBL today is that the projects often become too time consuming. The reason for this could be either that the tasks in the projects assigned are too big or too unclear. In order to reduce the feeling of confusion concerning where to start and what to do, proper guidance from a professor or a tutor is important. In addition, the workload may be too heavy if every class has a project, since it is hard for a student to have e.g. three projects in mind simultaneously. There should be an overall coordination between professors in order to prevent that the students in a class have projects in all their courses simultaneously.

Projects should be avoided in basic more theoretical courses because these courses require that the students get a complete overview of the course content. When doing projects the students tend to concentrate on the part of the course content that is relevant for their specific project. A good way to get a personal understanding seems to be when doing examples and getting explanations from a tutor or teacher.

PBL infrastructure

Meeting rooms are probably a good start. What will obviously be needed are workplaces designed in a way that group-based studying can be promoted, if the course involves a collective project. An internet-enabled computer-printer system should be available, in order to facilitate the project-making process. Individual and independent workplaces could also be provided in properly arranged rooms for students working on a project on their own.

Meanwhile there should be some sort of immediate connection with the laboratory, or department, responsible for the organisation of the course. Such connections could be achieved through the use of a dedicated e-mail for enquiries concerning the specific course.

Evaluation

- **Grades always needed, more extensive "grade reports" most welcome.**
- **Periodic feedback on the progress of the project - should be combined with guidance.**
- **Postgraduate students can become efficient tutors.**
- **Tutors used in guidance should participate in the grading process (since they have a closer contact with the groups). However, the professors should have the last word after meeting with tutors.**
- **Exams are not necessary, however in some cases individual projects or more traditional exams are a good complement in order to be able to evaluate each student on an individual basis.**

It was concluded in the discussion group that feedback should be given during the entire time that a project lasts in a PBL course. This will permit the students to better understand what is asked from them and the possible ways of approaching a potential solution. There should also be a final evaluation after the project has been completed. This evaluation should provide clear and constructive remarks on two things. Firstly, what was conducted efficiently from the students, and secondly, what proved to be more complicated or hard for the students to realise, and therefore was not completed in the proper fashion. The students will then see what they have a good understanding of, and in what areas they need to improve.

The tutor could be a volunteer undergraduate student who has already attended the same or a similar course. The tutors should take part in the evaluation process together with the professors since they have seen the level of effort and understanding the students have shown during the project. However, it is important that this tutor co-operates with postgraduate students and professors in order to avoid that the student tutor affects the decision of grades due to personal preferences. Thus, the professors should have the last word after meeting with tutors. The use of student tutors would also reduce the time that professors need to spend helping students.

It can be difficult to implement PBL learning in courses that is attended by lots of students. By working as groups, the number of projects to be evaluated is reduced. Working in groups could

motivate the students since the will inspire each other in finding an optimal solution for the given problem/task. They see that others deal with the same problems and that helping others will also contribute to their own improvement in the course.

However, working in groups also means that everyone gets the same marks. Ambitious students might feel unmotivated when other students in the group that have worked less will get the same credit. This problem should ideally be solved with the personal evaluation explained above and as mentioned further below. It is therefore important that there is an individual evaluation as well.

Motivation

- **The students should be able to choose the main content of their courses**
- **Separate evaluation of each student deemed necessary**
- **Conscious students and already convinced professors can promote PBL**
- **Both students and professors have to be motivated**

Student motivation:

Students can be motivated to actively participate and operate within a PBL environment. Motivating aspects of PBL courses, apart from the required credits needed for the diploma to be obtained of course, are mentioned just below.

a) Firstly, the thematic variety of the courses available to the discretion of the student would offer the unique chance to the student to take personal responsibility for their work.

b) Credit based incentives are always welcome and PBL based evaluation can provide a better overview of the quality of work produced and the effort invested in the project by the student than traditional exams. This way the student is required to take initiatives and be creative, thus revealing his true potential.

c) To motivate the students to learn by using PBL they have to get help in the beginning. There should be an active participation from the student in the topic selection process. To have the ability to choose the mainline of your course would increase the motivation of the student a lot.

d) Finally is should also be taken into serious consideration that the evaluation of the undergraduate does not depend solely on the efforts made by the student on the examination day.

Motivating professors:

To implement PBL in an efficient and constructive manner it is important that the academic circles are motivated as well. Therefore professors as well as students have to be equally drawn to the use of PBL.

It is time consuming to implement PBL and it therefore important to convince the professor that they also gain from implementing PBL. It is not only the students that benefit from it. It might be difficult to achieve that, since it might be hard to promise more research money earned and less time invested even thought this could be the effect in the long run.

Whatever the case, the best argument for implementing PBL is probably that the students would become more engaged in the lectures. There would be a two-way communication instead of the usual one-way communication during normal lectures. It would probably be more inspiring for the professors to give lectures, when they could exchange ideas with the students and also get feedback from the students.

Finally if the professor at the same time gave assignments/projects that could be useful input for his own research, mutual benefit would be achieved, as the professor would get a fresh perspective on his work, while invaluable experience would be gained by the students.

Lobbying uninitiated professors will probably play an integral part in the process. For the idea to be embraced by professors introductions could be organised by students conscious on the matter and academics who have already made good use of PBL. Student body unions can form committees for promoting PBL. SEFI can also be a powerful tool in the lobbying process.

Outside influences

Co-operation with companies and the introduction of real-life problems is always welcome as long as the educational process is not manipulated for the benefits of third parties and not of the students. Real-life problems always give a unique opportunity to the students to obtain invaluable experience and face actual challenging situations. All of the precautions mentioned, however, will inevitably have to be applied to any university activity, is order to ensure that the university remains an institution were basic knowledge and original research is conducted, for the benefit of science, and mankind.

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