

## **Designing and Implementing Problem Based Learning: Why is it so hard?**

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### **RESUMEN**

#### **El diseño e implementación del aprendizaje basado en problemas: ¿Por qué es tan complicado?**

El Aprendizaje basado en problemas no puede ser implementado fácilmente en el currículo sin hacer cambios estructurales. Entre ellos, los más relevantes son cambios culturales y de organización. El cambio cultural tiene que ver con las creencias tradicionales del profesorado y con las consecuencias del profesionalismo en las universidades. Se necesita una mejor comprensión del aprendizaje del estudiante para poder realizar los cambios necesarios. El desarrollo del profesorado es esencial para conseguir este cambio. También son necesarios cambios organizativos para conseguir que el ABP sea exitoso. Sin una clara y externa necesidad de cambio y un buen liderazgo, la implementación del cambio es difícil de alcanzar.

**Palabras clave:** aprendizaje basado en problemas, cambios culturales, cambios de organización, desarrollo profesorado

### **SUMMARY**

Problem-based learning cannot easily be implemented in a curriculum without making structural changes. The most relevant of them are cultural and organizational changes. The culture change requires dealing with traditional teacher beliefs and with the consequences of professionalism in universities. A better understanding of student learning is needed to make the necessary changes. Faculty development is essential in making the shift. Organizational changes are also needed to make PBL a success. Without a clear external need to change and good leadership implementation of change is hard to achieve.

**Keywords:** problem-based learning, cultural changes, organizational changes, faculty development

## **INTRODUCTION**

Problem Based Learning was introduced forty years ago at McMaster University in Canada in its medical curriculum. A few years later Maastricht University became the second university in the world to use this approach for its medical program. Since then the educational approach was rapidly introduced in many medical curricula around the world, but also in other fields like engineering, pharmacy, psychology, business studies, teacher education, and many others. Outside Higher Education the approach was introduced in vocational and general secondary education, and in some programs of education for children with specific needs. PBL is not a clear cut instructional method, but an educational strategy aiming at various educational goals and employing various formats. The common denominator in these approaches is the emphasis on active learning using a problem as the stimulus and starting point for the learning process (Bouhuijs 1993). In problem-based learning students are brought together in small groups of about 8-10 peers. During their first meeting they are confronted with a case or problem, even before they are presented with any course texts or lectures. They are expected to discuss the problem under the guidance of a teacher. Initially the group will produce a tentative analysis of the problem based on their prior knowledge. This will lead to questions about issues not understood, clarified, or explained initially. These questions will be used by the students as learning objectives for self-study. In the period that elapses before the next tutorial -usually a few days- students will work towards their learning goals by studying books, using internet, doing lab work etc.. Following this self-study phase, the students report back to each other in the tutorial, sharing what they have learned and evaluating the extent to which they have attained a better understanding of the problem (Moust et al. 2007).

*PBL has been around now for more than forty years*

Despite the rapid proliferation, the implementation of PBL is still considered a tough job: many attempts to use PBL have failed to reach the results expected. And experienced PBL experts still see the same implementation mistakes being made. This is the reason to pose the question: Why is it so hard to implement PBL successfully?

The answer to the question can be formulated at different levels: the teacher, the program, and the organization. An important point to make right from the start is that PBL affects all these levels. Many implementation problems are caused by ignoring this. In some schools PBL is introduced as a new tool without acknowledging that applying PBL has a lot more implications than introducing an electronic learning environment.

In this contribution I will look at two major issues:

1. PBL requires a shift in culture
2. PBL requires organizational changes

I will also address strategies which may be helpful in overcoming implementation problems.

### **PBL AS A CULTURE CLASH**

Last year some quality newspapers in The Netherlands published in their Science sections the results of a learning experiment reported in *Science* (Smith et al. 2009). This quite unusual so I checked the cited article. The authors describe an experiment they did in a large biology class. During a term 16 knowledge quizzes were organized and students could use electronic clickers to send their answers. The design was simple: the teacher would present a problem and asked the students to click their answer. After that they were given the opportunity to discuss their answers in small groups. No feedback was given on the correctness of their answers. After the discussion they were asked to click their answers again. Again, no feedback was provided. Finally a similar problem was presented and students were asked to answer individually.

The outcomes showed that results improve after group discussion. There was one striking result however: out of the group that answered wrongly at the first two attempts 44% gave the correct answer on the similar problem. So the headlines in the newspapers are: you can even learn when you don't have the right answers given to you!

The authors explain the results using constructivist theory, but that part didn't get much attention. Actually the experiment shows what is happening in PBL groups all the time, but many people still have difficulty in believing that it can work.

During one of my PBL workshops in Spain people reacted with disbelief when I mentioned that we don't correct students immediately when they make certain mistakes. I explained that students will find out when they study relevant literature concerning their stated problem and will return with better answers.

Here we have the first culture clash between PBL and main road Academia: Constructivist theories are contrary to the predominant academic belief system: Academia is about teaching True Knowledge, and imprecise ideas of students should not be expressed. PBL doesn't fit with this dominant Academic culture.

There is a second culture clash at a different level: the culture of professionalism. Obviously modern Academia has a culture of professionalism. Various sociological studies have yielded a number of characteristics for professionals, such as highly individualistic, independent in their dealing with their field, and putting their own discipline as more important than the organization in which they work. Anyone working in a university can easily find examples of these characteristics. And we can observe many universities where departments and highly ranked professionals can set their own work environment to a large degree without being bothered by others.

Problem-based learning however, presupposes co-operation across disciplines to deliver an integrated curriculum and requires teamwork by teachers

expressing common goals and common ways to deliver the program and to support student learning. Again, a shift in academic culture is needed.

In summary, the culture shock of PBL for traditional Academia consists of various elements:

Student learning is a central issue in PBL. Lecturing and structuring excellent true knowledge by teachers is not sufficient to be successful.

Co-operation between teachers is essential for success.

Implementing PBL successfully requires the recognition of the culture shock, and strategies to deal with these issues. Let us look first at student learning.

### **LEARNING PRINCIPLES AND IMPLICATIONS FOR PBL DESIGN**

One of the key issues in approaching the culture shock is the general lack of understanding among higher education teachers about how people learn. The common belief is that formal teaching is necessary for learning. Teaching methods from the 18<sup>th</sup> century are used to battle the complexities of the knowledge explosion. Research suggests that sometimes teaching is actually not very helpful for learning to occur.

Two guiding learning principles are central in PBL:

1. Learning in context.
2. Learning based on motivation.

It is essential for teachers to understand how these principles can be used effectively in a PBL approach. In traditional education the control of the teacher over content, methods and process is considered as the best way to guarantee good outcomes. In PBL there is a shift in balance which is not easy for teachers to accept and to respond to in an effective way.

Using their expertise teachers in PBL select topics, concepts, and problems in such a way that students become actively involved.

In designing the learning environment several educational design parameters have to be taken into account (Bouhuijs, 1998):

1. Complexity of the learning task. Active learning requires the learner to explore and adapt their existing knowledge structure in view of new information. If there is little connection, meaningful learning will be more difficult. Obviously what is needed is a certain optimal complexity, since very easy learning tasks will not result in active exploration either.
2. Learner involvement. Intellectual curiosity is the motivating force which stimulates the learner to learn. Building upon existing interests of learners (i.e. using real life examples they can relate to) is a good way to promote learner involvement.
3. Learner's logic. Teachers are experts in their field. They have an overview of their field which makes it obvious for them to present topics in a certain order, usually according to a general disciplinary framework. Learners do not possess this overview and may need a different route of entry to the field. Cognitive research also suggests that learners have misconceptions which are obstructions to further learning.

It is essential to take the learner's logic into account in developing a learning environment to promote active learning.

4. Learner's needs. The design of learning environment to promote self-directed learning should enable learners to define and fulfil their learning needs. Within the boundaries of professional requirements to be met at graduation, learners should increasingly have control over their way to reach those goals. In other words, the freedom to choose how and when to learn. Flexible learning arrangements are needed to achieve this requirement.

### **ORGANIZATION AND MANAGEMENT ISSUES**

From my own experience I dare to state, that most institutions introducing PBL underestimate organization and management issues. During the first decade of PBL mainly new schools managed to introduce PBL successfully. Probably some organizational conditions in those schools favored the implementation of PBL. The literature on innovations suggests that this is the case for any innovation: new organizations are in a better position to introduce changes than existing ones.

New ways to approach learning in Higher Education cannot be restricted to new schools however, so let us look at the kind of things that tend to go wrong when introducing PBL.

Many view PBL as a classroom technique rather than an educational systems approach. This leads to an underestimation of the task. It is naïve to think that PBL can be introduced without touching the curriculum. Usually the changes needed are big, and so one can expect teachers to worry about how their courses will look like in the new curriculum. Curricular changes always introduce these tensions, but in the case of PBL, the uncertainty is more intense. In traditional curriculum changes the classical fight is about the number of hours for a course and about the place in the calendar. As soon as the hours are divided individual teachers are in control again over their course. PBL affects the organization at various levels: it presupposes an integrated curriculum, and stronger co-ordination at program level. It affects the position of teachers and departments. Implementing PBL means that important parts of the traditional controls of individual teachers are taken from them. The traditional course content is now implemented in integrated courses and the traditional control over what students 'cover' is replaced by students who seek answers to their questions using a wider range of resources. And finally the number of teaching hours is replaced by something else, because the number of lectures is highly reduced. No wonder to see, that introducing PBL is initially seen by teachers as an attack on their current position, leading to what is generally described as a resistance to change. Ignoring these issues is one of the main reasons why the introduction of PBL fails in many institutions. Dealing with anxieties about change is a key issue in strategic management, and overlooking those issues is a major mistake.

And it requires adaptations in systems and structures to manage an integrated program properly: new checks and balances need to be established which may result in a different kind of ownership of the curriculum by teachers.

Another management problem which is generally not appreciated well enough is preparation time to implement PBL. Since PBL involves more team work, reshuffling content, learning about PBL, and time to resolve conflicts, redesign of learning materials, and time to review what others have produced, it is fair to say that the time needed to prepare a PBL program takes more time than what an individual teacher usually invests in reviewing an existing course. But the time factor also works in a different way. Much more preparation needs to be ready before the course starts, since all the discussion on what will be offered require teachers to do the preparation earlier than they are used to do. Participating in PBL workshops and other preparation meetings also take time. The initial time investment in introducing PBL is high, and there is also shift of this investment to an earlier point causing congestion problems. Unfortunately this time issue is overlooked in many organizations. Just assuming that teachers can do all this development work on top of their normal teaching load is a wrong assumption.

At a more operational level PBL also has a lot of management implications. Changing a large class lecture-based program into a small group, and flexible learning program requires adaptations to buildings, increased capacity to schedule classroom meetings and to inform teachers and students. One of my personal favorite questions about implementation of PBL is to ask whether the current organization of a classic curriculum is doing well in scheduling, timetables, booking classes etc.. If not, I explain that introducing PBL will multiply those programs, and I discourage the program to change to PBL unless they invest in their operational management.

### **HOW TO DEAL WITH IMPLEMENTATION PROBLEMS?**

PBL is an innovation for those new to this approach. There is quite some literature available on innovation and change in higher education which provides guidance for good implementation (Levine,1980;Bouhuijs,1989; Towle 1998). Levine (1980) studied many innovations in higher education in the USA. Although the world changed since he wrote his book ‘why innovation fails?’ he formulated two preconditions for successful innovation which are certainly relevant for PBL today: External pressure and Leadership.

The importance of external pressure, such as changed expectations in society, changes in professional standards, or changes in funding conditions require an organization to react as a unity, thereby overcoming in group fighting and stagnation. Formulated in a different way: if PBL is introduced as part of a response to an external need or pressure, there is a greater chance on successful implementation. Without an external need PBL may just mobilize resistance to a level which makes the change impossible. An important general strategy advice can be applied here: PBL needs to be part of a strategic plan in which internal and external factors are included.

Leadership is the second precondition for success: if leadership is weak PBL will be too difficult a strategy to be implemented successfully. Hersey et al. (2001) formulated some important characteristics of transformational leadership which are relevant in this respect.

1. Personal commitment to the transformation by the leadership. This commitment needs to be visible to teachers and external partners.
2. Firm, relentless, and indisputable communication of the impossibility of maintaining the status quo. Good leaders make clear, that there is no way to escape from the change.
3. Clear and enthusiastic communication of an inspiring vision of what the organization could achieve. Good leaders can motivate their faculty to move forward.
4. Timely establishment of a critical mass of support for the transformation. Good leaders can identify and involve key teachers in the change process.
5. Acknowledging, honoring, and dealing with resistance to the transformation. Good leaders are not afraid of resistance, but find ways to cope with it.
6. Defining and setting up an organization that can implement the vision. Leaders need to have an idea about the organizational and managerial implications of the change and have to act accordingly.

This list could be expanded, but the important message is, that leaders need to believe in why PBL is an answer to the problems of the institution, and to handle accordingly. Unfortunately I have worked with several institutions where the leadership saw PBL as an easy change and backed off as soon as the first signs of resistance showed up in the faculty. Without consistent support of faculty leadership, the implementation of PBL will probably end in a failure. Having identified the preconditions for successful implementation it is important to look at one of the important tools educationalists have to support the implementation of PBL: faculty development.

### **THE IMPORTANCE OF FACULTY DEVELOPMENT**

PBL is an educational approach which requires a number of educational skills of teachers which differ from traditional teaching skills. The role of the teacher is shifted from a presenter of knowledge to a promoter of learning. Faculty Development therefore is an important tool to introduce the teaching implications of PBL. One of the founding fathers of PBL summarized this role already in 1980: “The majority of the teachers in the basic sciences and clinical faculty have been brought up through a traditional system of learning since Kindergarten. Excellence in conventional teaching, accomplished by good lectures, brilliant seminars, or exciting patient rounds, is rewarded and builds reputations. There are few rewards given for efforts in innovative educational approaches or resource development. (...)These factors must be recognized and appreciated. They require multiple approaches. One must create opportunities for the teacher to understand and become motivated about both the advantages of PBL and the very natural aspect of teaching skills required. Possible arenas include occasional educational rounds and departmental or school meetings. Another approach is to create a reward system for change and give recognition for innovative teaching activities, equal to research and patient care, and the time to carry them out. Approval and even pressure from chairmen and the deanery are important. This includes pressures to attend workshops on PBL, teaching skills, and resource development”(Barrows&Tamblyn, 1980).

This lengthy quotation captures an issue which is usually not expressed openly by innovators: innovation doesn't move by itself, but requires pressures. This seems to create a contradiction, since PBL as a self-motivating approach for students needs self-motivated teachers. The quotation also puts Faculty Development into the wider framework of faculty tasks and points to leadership and management issues.

The preparation of teachers and students to PBL is an important task for educationalists. Both teachers and learners need to understand the why and how of PBL to enable them to work productively in a PBL environment.

The medical school in Maastricht made teacher training mandatory in 1982. A mixture of pre-service and in-service activities are used to prepare teachers for PBL and student ratings of their performance play a role in promotion and tenure decisions. Teacher training provides an initiation in PBL: new staff members are confronted directly with a different set of expectations about teaching and learning. In a workshop the resulting 'culture shock' can be dealt with directly. Workshops and seminars also provide a platform to shape new behavior and to provide teachers with a standard of performance for a teacher in PBL (Bouhuijs 1990). A training of several days, and continued monitoring and support for teachers are part and parcel of successful implementation of PBL.

But still.....sometimes I get email requests from various places for a half-day introduction to PBL because we start next week and our teachers need to know.....

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