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### Introduction to Problem Based Learning (PBL)

*(Or, What I learned in a week in Iowa)*

By Judith Graham, Bates Technical College



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# Introduction to Problem Based Learning (PBL)

By Judith Graham, Bates Technical College

Problem-based learning (PBL) is a student-centered instruction method where students learn about a subject, in our case, Information Technology (IT), using realistic problems in hopes of the student developing effective problem solving and collaboration skills with the goal being self-directed learning. While working in groups, students identify what they already know, what they need to know, and how and where to access new information that may lead to resolution of the problem. The instructor's role is as a facilitator of learning who provides the problem, helps the students outline the problem and, finally, monitors the learning. The facilitator must build students confidence to take on the problem, while also stretching their understanding. (Hmelo-Silver, 2004).

Attending the Working Connections IT Conference at the Iowa Western Community College in Council Bluffs, IA, presented by the AIM Institute of Omaha, NE (<http://www.aiminstitute.org/>), allowed me to attend the Problem Based Learning course which provided an entirely new framework in which to present information to my students and, as I am always eager to find new ways to engage my students, turned out to be the perfect class to meet my requirements. . The Problem Based Learning method has been a major component of NSF grant work that AIM has been realizing over the past number of years. The latest grant they are working on is NSF Grant Award Abstract #1104268 in which the problem based learning cases are being recreated as scenario-based learning modules that can be infused into many technical classes and can be shared through virtualization.

Problem based learning is student based learning which I had read about previously but had never taken the time to implement in my classroom. After completing this course, I only wish that I took it ten years ago when I first began teaching in a community college classroom. The instructor of the course, John Magill, is an excellent instructor. The course outline which can be accessed at <http://tinyurl.com/7nmu8gk> didn't begin to describe the interesting information we received or the great discussions that we shared. Although no handouts or power points were provided for the course he gave us a list of resources that we could access for further information starting with his own grant inspired website, <http://www.makinglearningreal.org/tools.html> .

The course work started with a getting to know each other session as would be used in a PBL classroom setting. Most of the participants in the course already knew each other through the AIM Institute grant work so mercifully this was swift. We next covered why do we even want to use problem based learning? Most students take IT courses to get a job. As instructors we are preparing them big picture-wise for the future and specifically for a job. In every class we teach we need to consider skills for which employers are looking. Skills or traits, both tangible and intangible, that fall into this list include being on time, responsible, able to collaborate, problem solve , think on their feet, hard worker, innovative and the list goes on. All of this can be included in every topic we teach.

It all starts with what I want them to learn. In most classroom, students don't know how to problem solve. The facilitator's role is to teach them how to solve their problems on their own. If the students don't feel frustrated, then the facilitator has been doing too much. So how is this accomplished? The steps to problem based learning are as follows:

1. Present students with real world problem
2. Make it a messy problem - there is no single answer
3. Use teamwork to solve the problem

The real world problem could be anything that you are trying to teach in your class. One point that appealed to me is to create a case for each objective in your particular course. For instance, one objective in a database concepts course could be:

**Explain the theoretical foundation of relational databases.**

That is not necessarily a real world problem at this point but it can be restructured into a real world problem. The facilitator rewords the objective as something that would be useful to a business. One example might be:

You are working at a database company teaching help desk employees database concepts in order to expand their knowledge base. What are the important concepts that these individuals need to know? Why are these important and how can they be used when designing a database?

A tool provided to help start the learning process was the Need To Know Board (NTKB) found at <http://thecasefiles.org> which includes a table with four questions consisting of facts, assumptions, questions and resources. The students brainstorm, deriving the facts and assumptions from the assigned case study needed to formulate the questions and find the resources that are needed to solve the problem.

Some points that come to mind as going through this process include the following. Your class objectives need to be clear and meaningful. If your objectives are vague and created mainly to meet a requirement for syllabus creation, this would be a good time to revisit those objective and rewrite them to actually serve a purpose before implementing problem based

learning. Next, the cases can be a day long, a week long or used over the entire quarter or semester. Depending on which objectives you as an instructor want to cover, and how these objectives work together, can help determine the length of the case. Finally, Problem Based Learning is a lot of work. However, the work is only done one time and after specific cases are created they can last a number of quarters with only minor revisions such as software updates, etc. If a number of individuals in a department at a college can work together, they can then share and revise the cases as a team.

Tools that are used at the end of the case to ensure learning took place include rubrics, case evaluations and peer review reports. Since a major aspect of PBL is collaboration and/or teamwork a means needs to be in place that ensures everyone contributed. A form that could be used is the Peer Evaluation form (appendix A) in which each team member evaluates the other team members' contribution. As most students do not like team projects this is a useful tool to encourage participation. Inevitably, for a variety of reasons, every project has non-contributors. Since there can be a number of cases throughout a semester, one remedy proposed, that I thought interesting, was making a team of all the less contributory students. This either results in students performing or dropping the class. Another useful form would be the case critique form given to each student at the completion of the case (Appendix B). This allows the student to give honest feedback as to whether the student felt the case was worthwhile and contributed to their learning. Finally, having the student journal about their experiences answering questions such as what was a surprise, what did you find out about yourself and what did you learn (without just repeating what the lesson was about) is another way to measure learning and knowledge gained.

The main benefit I received in regards to Problem based learning is I have found a new method to teach the material. As stated previously, I am always looking for new ways of presenting information and imparting knowledge in my classroom and, in my opinion, opportunities for teacher training doesn't seem to be as available for Community/Technical colleges as some other types of educators, so this was a great resource for me. In a nutshell, Problem based learning allows me, as an instructor, to develop real-world, complex and open-ended problems that might be met in the workplace, resulting in the student addressing the problem, identifying what they need to learn in order to develop a solution and discovering where to look (Google anyone?) for the appropriate learning resources. Once the case has begun in my classroom, I will then be able to act as a facilitator making sure the students discover a viable solution(s) and ensure they stay on track in completing the case with the intent of the students being encouraged to pursue self-directed learning and making connections among the concepts provided in the case. Google returns many hits in regards to Problem based learning but not a lot is being done in the Information Technology area. Problem- or Case based learning is a perfect solution because what career field is more problem based, imaginative, collaborative and hands-on than IT?

## Bibliography

Hmelo-Silver, C. (2004). Problem-based learning: What and How Do Students Learn?  
*Educational Psychology Review*, 16.



## Appendix A

## Checklist for Observing Critical Thinking and Team Interactions

Teacher \_\_\_\_\_ Course \_\_\_\_\_ Section \_\_\_\_\_

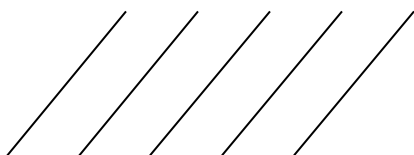
Scoring Table: 5 – nearly all the time; 1 - rarely, if ever

																			<p><b>Was the person well prepared to discuss the project at meetings?</b>            demonstrates a clear understanding of the PBCS goals            perseveres in the investigation without jumping to conclusions            monitors his/her own progress toward understanding and solution</p>	
																				<p><b>Was the person able to provide input to the team effort?</b>            speaks with clarity and directness            divergence or convergence in his/her thinking when appropriate            remains open-minded throughout the process            forms hypotheses based on observations and data; asks questions to inform</p>
																				<p><b>Was the person dependable and complete their portion</b></p>

Your Name: \_\_\_\_\_

Team

\_\_\_\_\_



							<b>of the project?</b> understands his/her role in the group listens actively and avoids interrupting when others are talking helps decide important issues by consensus
							<b>Did the person participate and complete the process?</b> sees concepts at work in a problem, reflecting a “global” vision recognizes the implications and consequences of his/her actions
							<b>Total Score</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>		

**Comments: Members:**

1-

2-

3-

4-

## APPENDIX B

**Case Critique Case #**

**Name:**

1. Was the case difficult to understand?
a. If yes; what made it difficult?
2. What information given in the case confused the issues?
3. What information given in the case clarified the issues?
4. What additional information should have been given?
5. What would make this a better case study?
6. State one specific thing that you learned – content.
7. State one specific thing that you learned – Teamwork.

8. Other comments