Using PBL, ICBL, and WebQuests

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Problem Based Learning
How do we describe PBL to administrators?

• **What is PBL?**
  An alternative teaching method to lecture.
  PBL stimulates critical and analytical thinking through solving problems or cases, typically in a collaborative group.
  Small groups are best.
  By having teachers act as guides and students working in groups, students learn collaborative skills, formulate hypotheses, conduct data searches, perform experiments, formulate solutions, etc.

• **How is it implemented?**
  Teachers roles changes from lecturer to providing resources, guidance, and instruction to students.
  Teachers should also encourage student participation and provide information to keep students on track. This guidance should help develop the students problem-solving skills.

History

The foundation of PBL comes from projects, field trips, lab investigations or any interdisciplinary activity that enrich and extend the curriculum.
“Problem based learning can be traced back to Socrates (c469-399BC) who believed that self-discovery was the only true way to learn.”

1950—Case Western Reserve University pioneered pedagogy whereby they incorporated instructional methods and strategies into a multidisciplinary laboratory.
History

1965—the Faculty of Health Sciences at McMaster University Medical School, Canada are considered to be founders of PBL.

History

1990s—PBL first evolved as a descriptive rather than analytical process. The structure of PBL was further developed by San Diego State University During the 1990s, and this work now serves as the basis for the curriculum in many university faculties.
How do we describe PBL to administrators?

- What kinds of resources are needed to do PBL?
  - The internet provides online books and manuals. Proper laboratory space.
  - CaseBook has been created as a tool used to aid PBL. CaseBook has four major components:
    - CaseManager: helps choose the appropriate case for the class, creates groups, and monitors students progress.
    - CaseExplorer: provides a problem-solving environment that guides students through analysis, learning, and reflection.
    - CaseMaker: provides a way for Educators to share their problems and tools for creating cases.
    - CaseLibrary: Cases of every topic are stored here.

What about ICBL?

- A variant of PBL, which allows students to develop questions that can be investigated and solved.
- Students learn how to locate and manage information, develop reasonable answers to questions, use scientific strategies (i.e. scientific method); etc.

  **How is it implemented?**
  - Students work in groups with a guide (the teacher) on a case.
  - The investigative cases provide flexibility for instructors and for students so they can apply their new problem solving skills to the "real" world, which does not follow a set procedure with one specific answer.

  **What kinds of resources are needed for ICBL?**
  - Similar to PBL, the internet and library are critical sources. Also, teachers are used as guides and a resource of information. A laboratory is important to carry out the procedure the students created to solve the problem.

  **How does ICBL differ from just cases?**
  - ICBL allows for more flexibility than simple cases. The ICBL places an emphasis on research-like environments so that students are capable of finding resources and thinking critically and analytically.
### What are Webquests?

- Inquiry oriented activities in which *some or all of the information that students interact with comes from resources on the internet*
- Encourage students to use higher order thinking skills
- Inquiry oriented activities *designed to make the most of the student’s time*

### Types of WebQuests

- **Short term Webquests** can be completed over 2 to 3 lessons
- **Long term WebQuests** take between one week and a month of school time to complete
How do WebQuests differ from cases and problems?

- Students are provided with the Internet resources using WebQuest; Instructors may provide lists of web pages and resources not on the web.
- Students must search and hunt for information using the Problem Based Learning or Case method.

How does the role of the teacher change with these methods?

- **WebQuest:**
  1. Become familiar with resources online
  2. Organize the resources into categories
  3. Identify topics that fit in with the curriculum

- **PBL**
  1. Must facilitate rather than direct student learning
  2. Must assure enough materials available
  3. Must construct problems that assist students to learn appropriate skills and knowledge.
How does the role of the student change?

• WebQuest
  1. Students are given more time to analyze, criticize, and assess the information they find by eliminating the need to search or hunt for information

• PBL
  1. Reliance on problems to drive curriculum
  Students solve the problems
  Students only given guidelines for how to approach the problem

What kinds of skills do students learning these methods develop?

• WebQuest
  • Students learn to analyze, criticize and assess information
  • Students learn to debate, discuss, or defend a particular stance

• PBL
  1. Learn to clearly define problem
  2. Develop alternative hypothesis
  3. Access, evaluate, and utilize data
  4. Develop clearly stated solutions to problems
• We have to give the administrators an example!!!
• We have to the administrators an example!!!
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Cases for Environmental Science

• “Improving on Nature”?  
  – www.sciencecases.org/nature/nature.asp and nature_notes.asp  
  – Follows the historical introduction of a species and its failure
• “Fecal Coliforms in Antarctica”  
  – www.sciencecases.org/coliforms...  
  – Fecal contamination and ocean currents  
  – Students design sampling scheme and evaluate data
More Environmental Science Cases

• “Watch Your Step”
  – Also on http://ublib.buffalo.edu/libraries/projects/cases/case.html
  – Calculate your own ecological footprint
  – Carrying capacity, economics, population growth
  – Students must evaluate own resource consumption

Good cases…

• Involve more than just reading a story and answering questions
• Do not require too much background knowledge
• Are clear about what students need to find out
• Are real situations
• Multi-part, interactive
Student assessment can be based on…

- Participation
- Question development
- Presentations
- Developing materials
- How convincing is the argument?
- Collaboration
- Generating charts and graphs
- Evidence for conclusions
- Peer evaluation

Evaluating Problems and Cases as a Learning Tool

- **Emphasis** should be put on the foundation of what **problem based learning is**: student centered learning focused on **independent investigation**, discussion, and exploration, with the teacher serving only as a **facilitator**.
- A **checklist** for a **good case**:
  - Learning is student centered
  - Teachers act as facilitator
  - Students are divided into small groups
  - Student must be actively engaged in the case to construct their own knowledge and understanding
  - Student must design their own plan to solve the problem(s) and identify the resources they need as well as implement all ideas
Evaluating Problems and Cases as a Learning Tool

• Judging the effectiveness of problems can be done through any of the following methods:
  – Written (concept exams, essays, reports, logs, journals; etc.)
  – Practical (simulations, demonstrations, and presentations)
  – Creative (concept maps, story boards, power point; etc)
  – Self-assessment
  – Peer-assessment
  – Mock cases
  – Self written cases

Where & How?

• Where?
PBL, ICBL and webquests can be used in any school and discipline but an emphasis has been put on PBL in medical schools. Med schools used to focus on memorization and regurgitation of information but researchers found that doctors had stunted problem solving abilities and an inability to independently continue their education after med school.

• How?
1. To use these methods the teacher must focus on only the major points and require the student to study further outside the classroom.
2. The students will have more freedom in the classroom and it will be important for the teacher to keep them on task.
3. Students must read and study outside the classroom. The teacher must make them accountable by using quizzes.
4. Students will need to learn how to answer open-ended questions
5. Teachers must communicate that this is not a game nor an experiment.
The Good, The Bad, The Ugly

PBL, ICBL and Webquest require the teacher to have less control of the direction of the classroom. From the students perspective they must take more responsibility for their education.

<table>
<thead>
<tr>
<th>Method</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBL</td>
<td>Students take more responsibility for themselves. Students are self-motivated to search out info</td>
<td>Must reallocate precious time</td>
</tr>
<tr>
<td>ICBL</td>
<td>Students will develop interpersonal skills</td>
<td>Students will become distracted by one another. Waste time dealing with conflict</td>
</tr>
<tr>
<td>Webquest</td>
<td>Students will develop independent research skills</td>
<td>Students will become distracted by the net. May appear busy when really lost</td>
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</tbody>
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...Leads to Effective Learning