

Measuring the Effects of Problem-Based Learning

*Progress in the development of a scale to
rate the acquisition of professional
knowledge through PBL*

Presentation outline

- Research project on „PBL“ at the TU Dortmund
 - Project outline
 - Research objectives
- After last year's discussion at ECER...
- Measurement of knowledge acquisition through PBL

Research project „PBL“ at the TU Dortmund







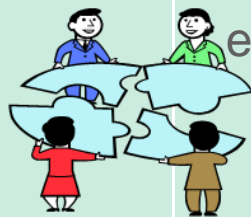


- **Project Title:** Efficacy of problem-based learning and professional development of university teachers in three countries: Germany, Sweden and the Netherlands
- Funded by the **German Ministry of Education and Sciences**
- **Timeframe:**
 - Spring 2009-Spring 2010: Conceptualization of study, research design and theoretical framework (*Werkstattphase*)
 - Spring 2010-2012: Data collection and recommendations on the implementation of PBL at German universities

Research objectives

- **Description** of problem-based learning scenarios and practices **across different European countries**
- Exploration of **teachers' attitudes toward teaching** in PBL and of the effects on the outcomes of problem based vs. 'conventional' teaching
- Exploration of the **outcomes of PBL as a teaching method in higher education** in a cross-national design

Effects of PBL – empirical evidence

- Positive effects on ‚soft‘ dimensions, such as self-assessed competencies and teacher ratings of students‘ performances (Jones et al., 2002)
- No effect or negative effect on the acquisition of knowledge, in self report and measured in ‚conventional‘ (summative, declarative) testings (Mamede et al., 2006)
- But: better performance in practical tests and problem solving (Colliander, 2002)

<u>Teaching</u>	<u>Testing</u>	<u>Match</u>	<u>Problems</u>
<p>,Conventional' teaching: Lectures and courses</p> 	<p>,Conventional' testing: paper-and-pencil test</p> 		<p>reproduction of declarative knowledge</p>
<p>Problem based teaching: course work, self-studies</p> 	<p>,Conventional' testing: paper-and-pencil tests</p> 		<p>poor alignment between teaching and testing</p>
<p>Problem based teaching: course work, self-studies</p> 	<p>Problem-based testing: case studies, formative evaluation, portfolios</p> 		<p>fairness, standardization, comparability</p>

Key questions after last year's discussion....

- Is there a difference in the structure of knowledge acquired through PBL?
- How do we conceptualize and measure this knowledge acquisition?



1. Clarification of terminology (ECER 2008)

2. Defining the problem (ECER 2008)

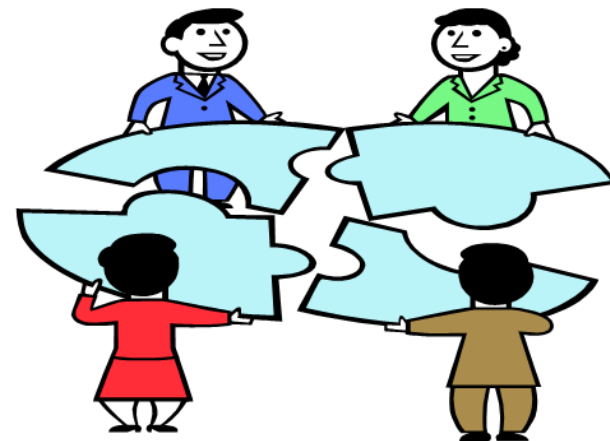
3. Analysing the problem, collection of ideas

4. Structuring / systematic inventory of ideas

5. Formulation of learning goals

6. Individual or collective
research and studies

7. Synopsis and solution



Conceptualization of ‘knowledge’

- Assumption: The acquisition of knowledge through PBL is **qualitatively different** to ,conventional‘ knowledge acquisition
- Conceptualization of ‘knowledge’: surface vs. deep approach (i. e. Marton, 1982, Marton & Säljö, 1976a, 1997)
- Connection to **problem solving** and **professional knowledge** (Laurillard, 1997)

Measurement of knowledge acquisition – solution I

- **True/false or multiple choice items** with connection to professional aspects
 - i.e. Maastricht Progress Test
 - “Women are at higher risks for depression” => true/false?
- Quantitative and differential measures: **amount of knowledge** acquired
- Problems:
 - measurement of rather declarative/reproductive knowledge
 - poor alignment to aims and means of PBL

Measurement of knowledge acquisition – solution II

- Measurement through problem-based tasks: **text reading experiments** (Dahlgren, 1975; Marton 1975b)
 - text-based questions aiming at understanding of principles rather than facts
 - “Why does a bun cost one pence?”
- Qualitative measures: **different levels of understanding** (Dahlgren, 1997)
- Problem:
 - „texts as metaphors for classes“ (Marton & Säljo, 1997)

Problems

- What does this conceptualization of knowledge imply for the assessment?
- (How) Can we combine the advantage of the two approaches to measure the acquisition of knowledge through PBL?



Thank you very much!

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The screenshot shows the website for the PBL project. At the top, there is a navigation bar with links for 'START SEITE', 'NEWSLETTER', 'KONTAKT', 'SUCHE', 'IMPRESSUM', and 'INTERNET'. Below this, a breadcrumb trail reads 'Sie sind hier > Startseite > Forschung / Projekte > Laufende Projekte > PBL > Startseite'. The main content area features a large photograph of the project team, with a caption identifying them from left to right: N. Valk-Draad, A. Schulkmann, J. Sicken, B. Roters, F. Eder, and in the back row, Frau Prof. Dr. S. Neitz-Göckel. The text below the photo states: 'PROJEKTITTEL: PBL - WIRKSAMKEIT PROBLEMBASIERTEN LERNENS ALS HOCHSCHULDIDAKTISCHE METHODE' and 'Ein Ansatz zur Professionalisierung von Nachwuchs-wissenschaftler/-inne/n im internationalen Vergleich von Schweden, Niederlande und Deutschland'. On the right side, there is a 'NEWS' section with dates from September 2009 to March 2009, and a 'TERMINE' section with dates from 14.10.2009 to 01.07.2009. The website is sponsored by the Federal Ministry of Education and Research.

Knowledge-based Items, examples from Psychology

„A task that is finished is better kept in mind than a task that is not finished yet.“ (Learning and Memory)

„When in positive mood people can be much easier be convinced of something than when in bad mood.“ (Motivation and Emotion)

„The drug *Mondafinil* is often used by people who want to shorten their sleeping periods.“ (Neurochemisty and Pharmacology)

„Elderly people have greater difficulties in planning a social event than in conducting a complex planning task.“ (Developmental Psychology)

„Women are more creative when writing SMS than men.“ (Language)