



THE UNIVERSITY OF NEW MEXICO ♦ HEALTH SCIENCES CENTER
SCHOOL OF MEDICINE

PBL: Past and Future

7th Asia Pacific PBL Conference
China Medical University
Shenyang, P.R. China

Ellen Cosgrove, MD FACP
Professor, Internal Medicine
Senior Associate Dean, Education

Objectives of this lecture

Demonstrate how **adult learning theory** forms the basis for problem-based learning.

Share **evidence that PBL is effective:**

better diagnostic and communication skills
greater appreciation for the cultural, legal,
and ethical aspects of healthcare
demonstrate greater responsibility
greater ability to cope with uncertainty
self-directed learning skills

Illustrate **innovations** in PBL from international settings

Physicians & Scientists need skills to learn outside of Teacher-centered settings

GOALS: Independent decision-making;
Ability to cope with uncertainty

- students develop motivation and skill to maintain competencies, acquire new ones and commit to values
- Students learn how to deal with new situations never before seen

Adults link new knowledge to *previous experience*

- Growing reservoir of experience is the basis of adult learning
- Connected to physical and psychological maturity
- Must fit with current situation of learner

Learning by Doing

“ He has to ‘see’ on his own behalf...the relation between means and methods employed and results achieved...Nobody else can see for him and he can’t see just by being told...”

The Theory of Inquiry

John Dewey, 1938

Defining PBL: “A house with many rooms”

Students responsible for their own learning.
Faculty set the learning objectives

- Clinical problems form the stimulus for learning
- Discussion generates hypotheses which motivate further learning.
- Students do independent, self-directed study & return to tutorial prepared to discuss learning issues.
- Faculty facilitators guide learning via discussion

Theory: advantages of PBL

- Learner-centered: active learning
- Fosters self-directed learning skills
- Opportunity for teamwork, respect, communication skills
- Integration of basic and clinical science
- Constructivist: new knowledge builds on existing framework

The Promise of PBL



PBL: Systematic reviews of the Evidence

PBL does NOT show improved knowledge outcomes compared with 'traditional' curricula

PBL costs more than traditional curricula

Student satisfaction higher with PBL

Colliver JA. Effectiveness of Problem-based learning curricula: Research and Theory. *Acad Med* 75 (2000): 259-266.

Newman M. A pilot systematic review and meta-analysis of the effectiveness of PBL. (2003) www.ltsn-01.ac.uk/docs/pbl_report.pdf

Limitations of Meta-analysis of curriculum outcomes

- Curriculum-level studies confounded by many variables
- “Blinded” interventions not possible
- “Uniform” PBL interventions do not exist
- “Pure” outcomes research not possible

Albanese M PBL: why curricula are likely to show little effect on knowledge & clinical skills. *Medical Education* (2000); 34: 729-738.

Ferguson K PBL: Let's not throw the baby out with the bathwater. *Medical Education* (2005); 39: 350-355.

IS Knowledge ENOUGH? the COMPETENCIES movement

To practice medicine, a physician needs

- **knowledge,**
 - **skills,**
 - **Attitude**
-
- **And needs to *put them into practice***

Competency movement

- Greater accountability of the medical profession to the public
- Taking responsibility, not just for teaching our students, but for assuring that they can put knowledge into practice

Comparing the systems...

PROCESS BASED

- Focus on content: knowledge acquisition
- Teacher centered
- Assessments a proxy for practice (tests with cases)
- Fixed time to complete the program

COMPETENCY BASED

- Focus on outcome: knowledge application
- Learner centered
- Assessments “real world” (observation of patient encounters)
- Time is variable

Carraccio C et al. Shifting paradigms: from Flexner to competencies. *Acad Med* 2002; 77:361-7.

CanMEDS Competencies

- Medical expert,
- communicator,
- collaborator,
- manager,
- healthcare advocate,
- scholar,
- professional

ACGME 6 Core Competencies

1999 USA:

- Medical knowledge,
- patient care,
- communication skills,
- ethics & professionalism,
- practice based learning & improvement,
- systems based practice

How do PBL graduates perform
with the new competencies?

Time for a new systematic review!

from

The National University of Singapore

Koh, G, Khoo, H, Wong, M, Koh, D.

The effects of problem-based learning
during medical school on physician
competency: a systematic review.

CMAJ 2008; 178 (1): 34-31

PBL & Competency:

Koh's design for the new Systematic review superior to older studies

- Includes ALL studies linking PBL to outcomes after graduation
- Required a 'traditional curriculum' control group
- Analyzed self-assessment separately from independent observations (poor correlation of self assessment with reality)

Norman G. Problem based learning makes a difference.
But why? *CMAJ* 2008; 178 (1):61

PBL fosters critical competencies: STRONG effects (Koh review)

- Increased appreciation of cultural, legal, ethical aspects of healthcare
- Increased ability to cope with uncertainty
- Increased diagnostic accuracy
- Increased communication skills
- Increased responsibility & reliability

PBL fosters critical competencies:
Moderate effect (Koh)

Increased self-directed learning
skills

Koh study shows that
PBL makes a difference
Where it matters most

Cultural Appreciation

Ethical Skills

Communication Skills

Diagnostic Accuracy

Interesting paradox

Graduates of PBL schools rate their own medical knowledge LOWER than graduates of 'traditional' schools

OBJECTIVE evidence (licensing exams, specialty certification exams, peer & other professional ratings):

knowledge is EQUAL in PBL & traditional

Norman G. *CMAJ* 2008; 178(1) 61-61.

PBL IS Effective in other important ways...

- PBL has a positive effect on the learning environment
- PBL graduates rate their schools more positively
- PBL enhances intrinsic interest in the subject

Bligh J PBL: the story continues to unfold. Med Educ (2000); 34:688-

PBL enhances self-directed learning skills

The enhanced self-directed learning skills may be maintained over at least a decade: the Canadian experience

Shin JH, Haynes RB, Johnston ME Effect of Problem-based, self-directed undergraduate education on life-long learning. CMAJ (1993); 149 (6):794-5

PBL more effective for some students than others...

- Women (team-building, collaboration, information-sharing, connectedness, willing to take on work to improve the group)
- Older students (desire more independence in learning, willing to accept more personal responsibility)
- Students with higher MCAT scores

Distlehorst LH et al. Problem-Based Learning Outcomes: The Glass Half Full. *Acad Med* 80 (2005): 294-299.

PBL more effective for some students than others...

Students from disadvantaged backgrounds have lower attrition (drop-out/flunkout rate) and faster progress through PBL curricula than traditional

IputoJE, Kwizera E. PBL improves the academic performance of medical students in South Africa. *Med Educ* (2005); 39:388-93.

PBL may produce more or better Primary Care Physicians

- New Mexico
- Bahrain
- Canada

Tamblyn R et al. Effect of a community-oriented problem based learning curriculum on quality of primary care delivered by graduates: a historical cohort comparison study. *BMJ* 331(2005):1002-.

The other side of the coin

Problems of PBL

PBL at its worst...



Disadvantages of PBL

- Students may not be the best judge of what info is relevant or useful
- Students with varying backgrounds may not have enough context to build on within PBL
- Learning in Context may make a concept less available for students to generalize (Bransford's concept of Knowledge Transfer)

Bransford, J et al. How People Learn. National Academy Press 2000

Disadvantages of PBL: Faculty view

- Faculty resource-intensive
- Faculty frustrated with 'facilitator' role rather than 'expert' role
- Faculty prefer explicit learning objectives, not "Hide and Seek"

“PBL” in US Medical Schools

- 70% of US Med schools use PBL in the pre-clinical years
- 45% use it for <10% of their formal teaching
- 6% use it for > half of their formal teaching

Kinkade S A Snapshot of the status of PBL in US Med Schools Acad Med (2005);800:300-301

What do MDs value in PBL?

- **Tutors:**
knowledgeable about content, yet able to facilitate
- **Case problems:**
up to date, realistic, challenge students to address behavioral, public health, economic, social issues as well as medical aspects
- **Students:**
prepared, willing to participate in peer teaching, supportive of group learning process

Lohfeld I, Neville A, Norman G PBL in UME: a qualitative study of Canadian residents. Adv Health Sci Educ Theory Pract (2005) 10:189-214.

The Future of PBL

Approaches Faithful to the spirit of PBL

active group learning,

respect for students as colleagues

challenging, multi-dimensional cases

Address these problems:

student preparation and role in tutorial

faculty resources and role

PBL : the Cutting Edge

- Structured Tutorials (Harvard, UNM)
- Foundation Concept (McMaster)
- Faculty-fostered problem-finding (TWMU)
- Student-developed PBL cases (UNM)
- Student-led tutorials (Bahrain)

Structured Tutorial: Harvard

David Cardozo

- Key concepts defined in “anchor lecture” and pre-tutorial assignments
- Students prepared with theoretical model
- Faculty decides key learning objectives
- Students have defined roles in group

Structured Tutorial: UNM

EVE ESPEY

- Advance preparation: “home review case with problem set completed BEFORE 1st tutorial session
- Critique of assigned articles 2nd session (Study design; “how to” review an article)
- Oral case presentations
- “Cornerstone” presentation: summary of key points from the case

Espey E, Ogburn T, Kalishman S, Zsemle M, Cosgrove E.

Revitalizing Problem based learning: student & tutor attitudes towards a structured tutorial. *Medical Teacher* 2007; 29:143-149

Differences between traditional and structured tutorial

TRADITIONAL

- No advance preparation by students
- Minimal evidence based medicine
- Free inquiry into learning resources

STRUCTURED

- Requires advance work by students
- Structured review of scientific articles (EBM)
- Less student searching for resources

Structured Tutorial Pro & Con

ADVANTAGES

More in depth learning

EBM practice

Oral presentation
practice

Formal presentation
(ppt) practice

DISADVANTAGES

More work for students

Less free inquiry

Labor intensive for
faculty to initiate

Tutors require more
subject knowledge

from CONCEPT to Problem (PBL does a “180”): McMaster

“Foundation”—Faculty sets clear learning objectives.

- Major concepts such as homeostasis covered in lectures create the framework for tutorial and review at the end of each unit
- Other cases illustrating the concept facilitate knowledge transfer by demonstrating the major concept in more than one clinical context)

Still PBL: Students work from concepts to problems

Problem-finding – Tokyo Women's Medical University

- Modified PBL : Faculty explicitly encourage problem-finding skills in intervention group
- Significant improvement both in number and quality of the problems identified post intervention

Yoshioka T et al Facilitation of Problem Finding among 1st yr med students undergoing PBL. Tch Lrn Med (2005); 17: 136-141

Student-developed PBL cases: UNM

Betsy Van Leit

Rural health interdisciplinary program:

- Students developed over 225 cases in 10 years following faculty guidelines
- Cases demonstrate excellent congruence with faculty guidelines and address key rural NM health issues

Van Leit B & Cubra J. Student-developed PBL Cases: preparing for rural healthcare practice. Rural & Remote Health (2005); 5:399 online rrh.deakin.edu.au

Student-led tutorial: Arabian Gulf University (Bahrain)

- Random, controlled trial comparing student-led to faculty-led tutorials
- Student exam scores comparable in both groups
- Student-led groups were perceived superior in feedback, tutorial atmosphere, decision-making, and support for the group leader
- Problem-analysis in 1st session more difficult in Student led groups

Kassab S et al Student-led tutorials in Problem-based learning: educational outcomes and student perceptions. *Medical Teacher* (2005); 27: 521-526.

PBL in Large Class: Sheffield

- a class of 246 randomized to:
 - 22 large class “integrated learning activity” groups led by one pair of facilitators
 - or
 - 5 traditional PBL groups, each led by a facilitator
- Same objectives & assessments for both groups
- No difference in learning
- Students prefer small group

Roberts C et al. The introduction of large class PBL into an undergraduate medical education curriculum: an eval. *Med Teach* (2005); 27: 527-33

CONCLUSIONS

- **Adult learning theory** forms the basis for problem-based learning, but advances in cognitive science suggest the need to re-think some aspects of PBL.

PBL is **effective**: fosters competencies critical to medicine, promotes collegiality in the learning environment, promotes self-directed learning

Cutting-edge approaches address the drawbacks of PBL by providing faculty guidance and reducing the costs.