

Problem Based Learning and its Role in Vertical Technology Transfer

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PBL in the context of this workshop

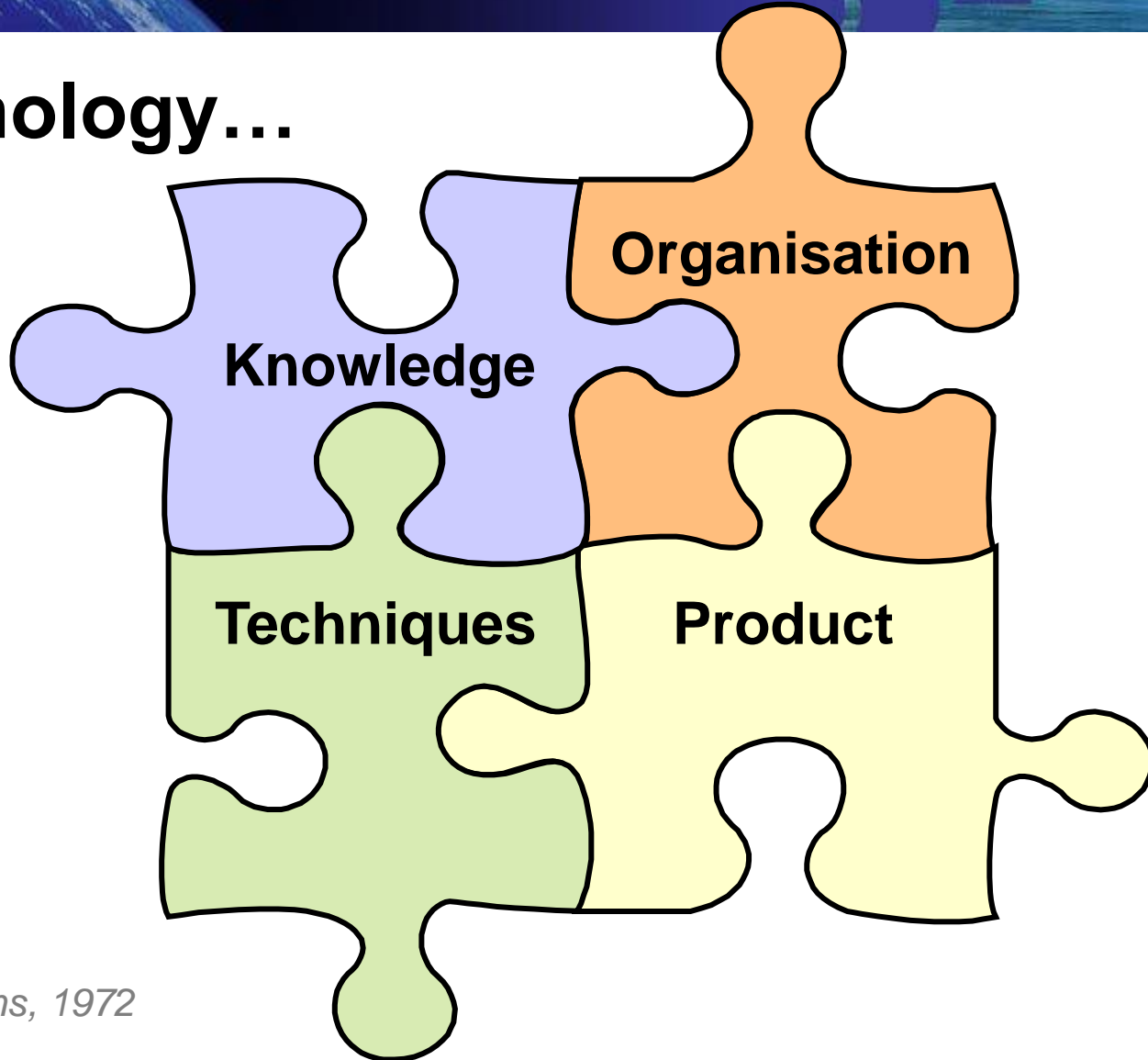
- Which, if any, role does Problem Based Learning (PBL) play in technology transfer?
- I attempt to provide an answer to this question before proceeding on to the presentation on PBL



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Technology...





... and technology transfer (TT)

- Horizontal TT: The Techniques component can be - and often is – transferred in ‘development’ projects
- ... but the components ‘Knowledge’ and ‘Organisation’ are often not transferred, nor are they easily transferable, leading to ‘white elephants’!
- Vertical TT: PBL (= PBRResearch) deals with the component **knowledge**, i.e. knowledge generation, dissemination and use



Outline of the Presentation

1. Why introduce problem based learning in universities in Africa?
2. What is problem based learning?



4. Why introduce problem based learning in universities in Africa?



Some of the main challenges to universities in Africa

- Irrelevant curricula, not responsive to African society
- Traditional approaches to teaching and learning
- Mass education, 'poor' students, inequities in access
- Brain drain



Why introduce PBL in Africa?

CHALLENGE 1:

Irrelevant curricula, not responsive to African society

Irrelevant curricula – not only an African problem

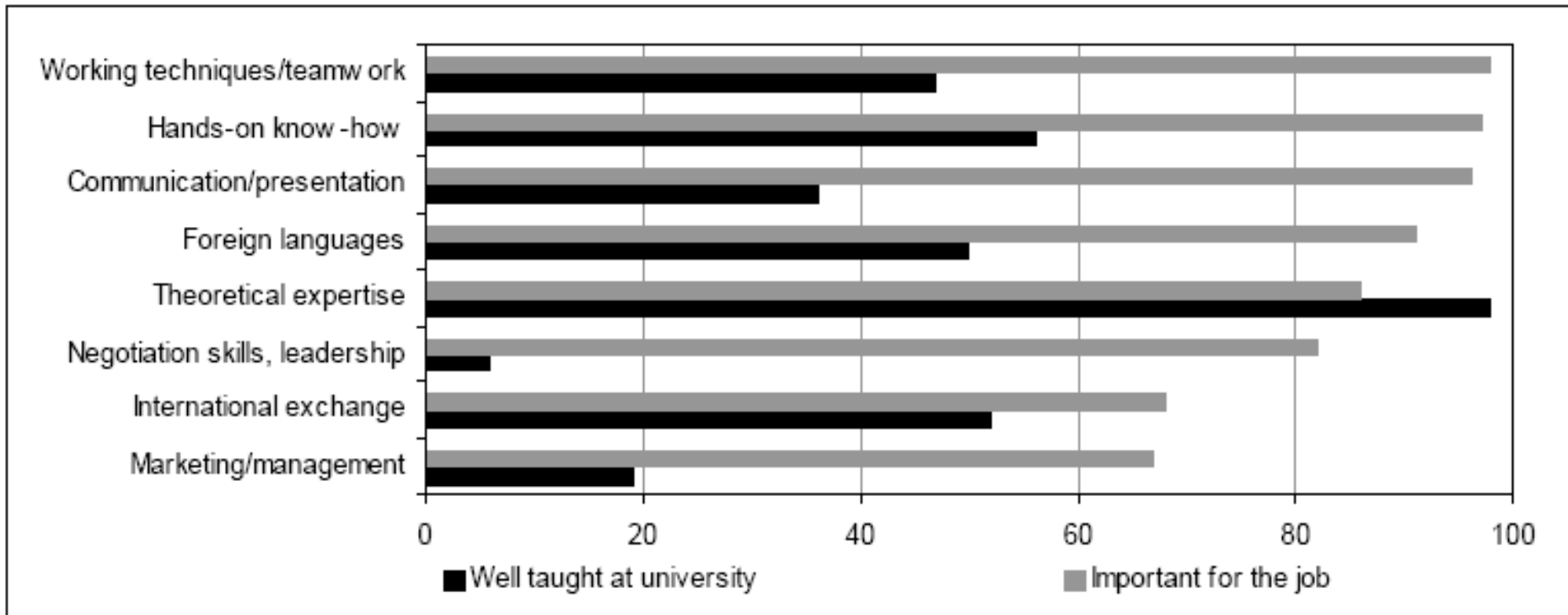
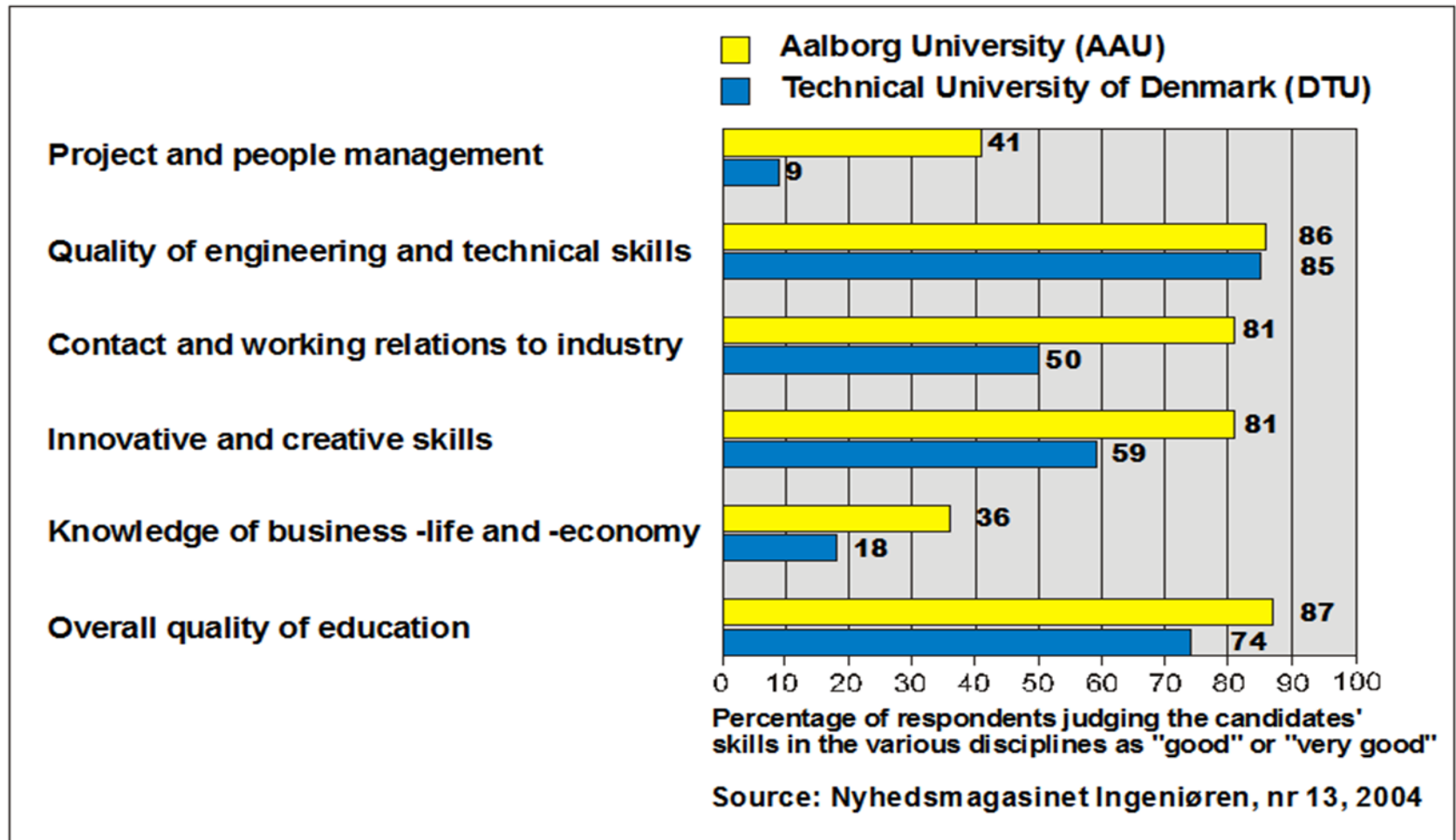


Figure 4 Comparison of capabilities taught at universities and required in professional life by young professionals [7]



Relevant curricula at university?





Survey among employers 2002

- 57% of private employers prefer candidates from AAU over candidates from [a traditional university]
- Reasons stated:
 - good skills in team work
 - innovation skills
 - project management skills
 - ability to acquire new knowledge and skills
 - methodological and structured way of working



Survey among employers 2002

One respondent in the survey said:

- *“The ones [i.e. the candidates] coming from, for example, Aalborg University, go in and work in projects from the start.”*
- They ‘hit the ground running’ - no lengthy ‘on-the-job’ training is needed!



PBL and Relevance to Society

PBL emphasises

- the use of 'local time and place' knowledge, whether indigenous, informal or formal
- combined with general scientific knowledge
- in analysing and solving local, i.e. African, real-life problems



Why introduce PBL in Africa?

CHALLENGE 2:

- Irrelevant curricula, not responsive to African society
- Traditional [i.e. lecture-based] approaches to teaching and learning

Tanzania Commission for Universities (TCU) recommends:

UQF Level	% on Lectures		% on Seminars and Tutorials		% on Assignments		% on Independent Studies and Research		% on Practical Training	
	Conventional mode	ODL Mode	Conventional mode	ODL Mode	Conventional mode	ODL Mode	Conventional mode	ODL Mode	Conventional mode	ODL Mode
6	40	20	10	5	10	30	10	35	10	10
7	40	20	20	5	10	30	20	35	10	10
8 (BSc)	40	20	20	5	10	30	20	35	10	10
9 (MSc)	30	20	20	20	20	30	20	20	10	10
10	10	10	10	10	10	60	60	10	10	10



The World Bank recommends:

- *“The learning process now needs to be increasingly based on the capacity to **find** and **access** knowledge and to **apply** it in problem solving. Learning to learn, learning to transform information into new knowledge, and learning to translate new knowledge into applications become more important than memorizing specific information”* (World Bank 2002, p. 29)



PBL and Learning

PBL takes its point of departure for the learning process in an ill-structured, real-life problem

PBL emphasises

- transformation of information into new knowledge
- application of knowledge for problem solving
- learning to learn



PBL from a student perspective

- Working with real life problems meets the interests of students and therefore enhances motivation, study efforts and learning outcomes
- PBL develops students' professional identity and skills, f.ex.
 - problem solving skills, incl. analytical and methodological skills
 - ability for critical thinking
 - project management skills
 - communication, negotiation and conflict resolution skills
 - life long learning skills



AAU Students on Learning

- *"This way of learning is much better than only attending lectures, because I have to know why I need to learn this. When I know the objective clearly, I learn much better."*
- *"When working on a problem, I am strongly motivated and attracted. We need to solve this problem."*
- *"We are engineers – our responsibility is to solve real technological problems."*
- *"I think that it becomes easier when you learn technical matters in groups. Normally we use the blackboard to discuss things."*





Learning to Learn

City University of Hong Kong:

After 15 months of study, 'poor' first year students following a PBL curriculum showed greater overall improvements (28%) in **meta-cognitive processes of planning, monitoring and evaluating their own learning** than a matched group of 'good' first year students following a non-PBL curriculum with the same contents (0%).



Why introduce PBL in Africa?

CHALLENGES 3, 4 and 5:

- Irrelevant curricula, not responsive to African society
- Traditional approaches to teaching and learning
- Mass education, 'poor' students, inequities in access

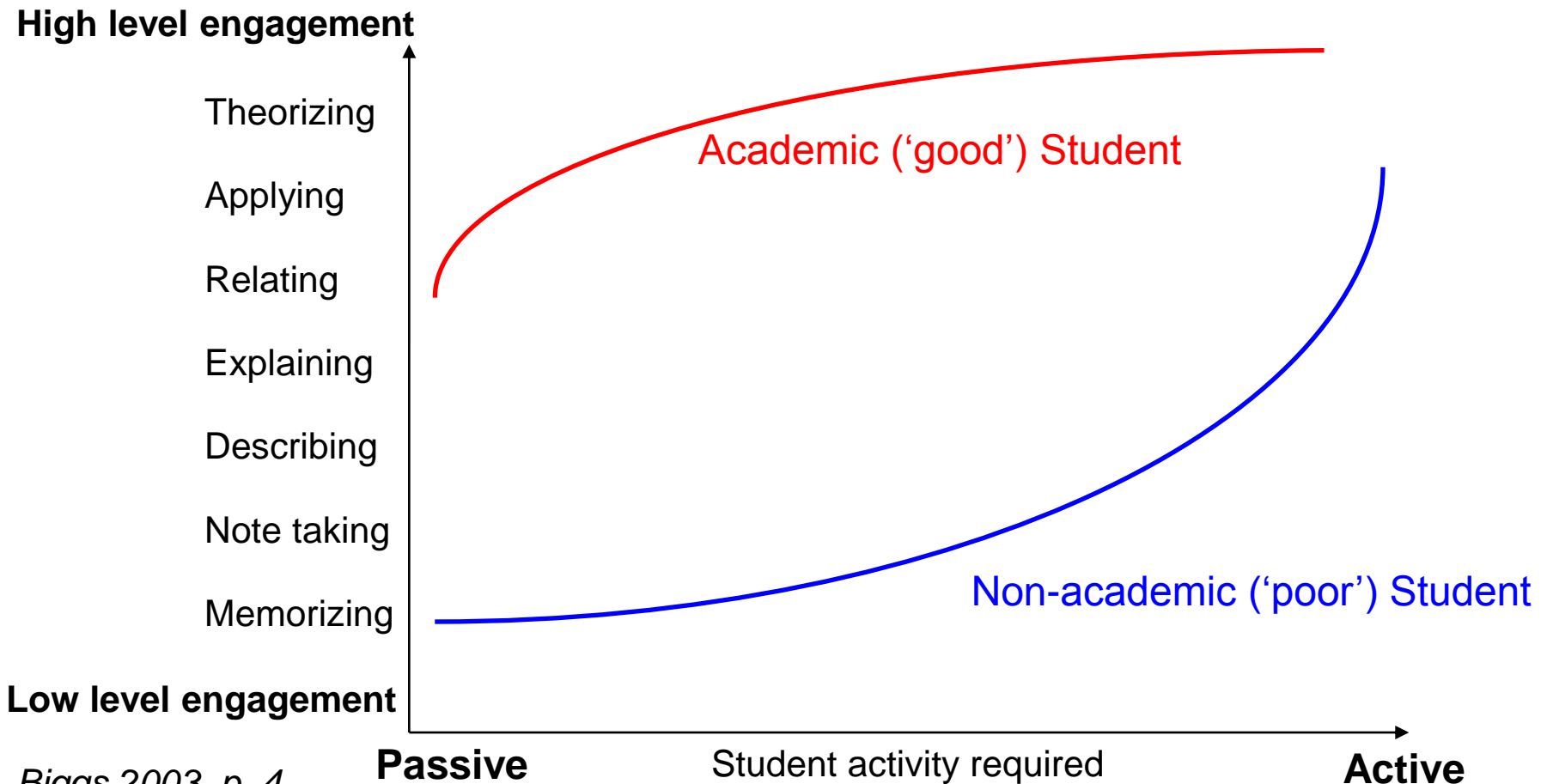


PBL and Mass Education

PBL enhances

- peer teaching and peer learning, thus
- “transforming a class of 500 students into 500 teaching assistants” (Biggs, 2003, p. 112) and
- reducing staff work load on lecturing and marking individual exam papers.
- Self- and peer assessment can further contribute to reduction of teachers’ work load

PBL and 'Poor' Students





PBL and Inequities

PBL addresses

- social inequities, because ‘poor’ students often do better in a PBL environment
- gender inequities, because women are attracted to technological educations by the prospect of solving real life problems.

Thus, PBL increases diversity among students



Diversity is an important source of innovation

Diversity	Effect on innovation
An increase in diversity in the Diversity Index with respect to:	...implies an increase in the chance of innovating by a factor of:
Gender	2,1
Education	1,5
Age	0,3
Ethnicity	1,3



Why introduce PBL in Africa?

CHALLENGE 6:

- Irrelevant curricula, not responsive to African society
- Traditional approaches to teaching and learning
- Mass education, 'poor' students, inequities in access
- **Brain drain**



The Brain Drain

- “More African scientists and engineers are working in the United States than there are in Africa” (Ndulu 2004, p. 60)
- Estimated African educational investment in highly skilled emigrants to the US: US\$ 640 million in 1990 (Ndulu 2004)



PBL and Brain Drain

PBL

- provides an intellectually challenging learning and research environment
- promotes entrepreneurship and self-employment

PBL may also

- enhance the students' sense of 'ownership' of their education and their society
- utilise the skills and knowledge of highly skilled Africans abroad as co-supervisors and sources of otherwise inaccessible information



**Time for short clarifying
questions to Why PBL?**



6. What is problem based learning?

- a) The Learning Theory
- b) Quotes on PBL
- c) PBL Principles
- d) Conclusion

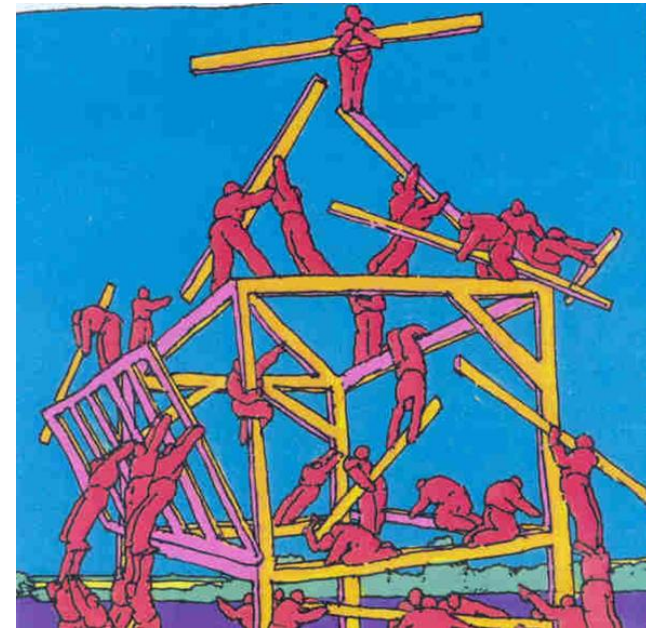


**Is this
learning?**

The Learning Theory - 1

Based on a **social constructivist** perception of learning and teaching:

Learning is the student's individual process of constructing knowledge and meaning, based on information inputs from many different sources and in social interaction with others (peers, teachers, experts etc.)





The Learning Theory - 2

- Based on a **social constructivist** perception of learning and teaching:
 - **Learning** is the student's individual process of constructing knowledge and meaning
 - **Teaching** is the "setting up of a situation from which a motivated learner cannot escape without having learned" (Cowan) – teaching is not (only) lecturing !!!



Lila M. Smith



Is this teaching?

“Teaching does not mean transferring knowledge but creating opportunities for producing and constructing it.” (Paulo Freire)



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Paulo Freire, Brazilian educator (1921-1997)

- “Education is a way of intervening in the world”
- Freirian Critical Pedagogy is similar to PBL in most aspects



University of Brasilia

First PBL university in the world established
1960 (?)

Main aims:

- ✓ Counteract scientific dependency on the West
- ✓ Help solve development problems in Brazilian society



What is PBL?

- "PBL reflects **the way people learn in real life**; they simply get on with solving the problems life puts before them **with whatever resources** are to hand." (Biggs 2003, p. 232; emphasis added)



PBL Learning Principles – 3 Dimensions

➤ **Cognitive dimension:**

- Problem based
- Contextualised (real-life problem)
- Action oriented
- Experience based
- Project organised



PBL Learning Principles – 3 Dimensions

➤ **Content dimension:**

- Interdisciplinary
- Exemplary
- Theory – practice relation
- Critical



PBL Learning Principles – 3 Dimensions

➤ Collaborative dimension:

- Participant directed
- Team organised
- Dialogic
- Democratic

*Graff and Kolmos 2003;
Qvist 2008*



PBL and knowledge generation

- PBL is a 'Mode 2' approach to knowledge generation, involving a multitude of 'problem stakeholders' in the processes of learning and research
- Thus, PBL enhances knowledge dissemination and sharing, thereby increasing actual use of study and research results
- PBL is a road to 'africanisation' of (higher) education



What is PBL? Summing up

- The point of departure for the learning process is an ill-structured real-life problem which motivates and activates students
- Based on the learning theory and the learning principles PBL can be implemented in many different ways
- Thus, PBL is not a certain prescribed 'How to do' teaching and learning method
- There is no 'right' or 'best' PBL approach – each university has to develop its own PBL model, adapted to the given context



*Thank you very much
for your attention*

*- time for discussions,
questions and answers*



Kwaherini !!

All comments and questions to this presentation will be welcomed at:

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