

Problem-based Learning In KNUST



Education & Training

*The 5th Summer School, KNUST.
College of Science Auditorium, KNUST, 8:50am – 9:20am, 19th Aug., 2015.*

Sustainable Development of
Tertiary Institutions
in Ghana Amidst
Economic and Security Challenges

Acknowledgements

- **KNUST Summer School Organizers:** Chair & Members
- **IPO/IDL/BSU:** Prof. W. Otoo Ellis, VC—KNUST (Co-Chair, PBL-EL, UNESCO), Prof. W. Oduro, Prof. R. Abaidoo, Nana Prof. E. Badu & Prof. I.K.Dontwi
- **BSU PBL EL Team:** Mr. Chris Addo, Mrs. Rebecca Essel, Mr. Richard Bruce Lamptey, Mrs. Ida Saeed, & Dr. Gabriel Okyere
- **BSU PBL EL Northern Partners:** Prof. Henrik Bregnhøj, Prof. Mona Dahms, & Dr. Hanan Lassen Zakaria in Denmark

Introduction

National situation being addressed by education and training

KNUST the Technical University

KNUST Educational Philosophy

The Challenge

Our Quests & Questions

National situation being addressed by education and training

- Right to Education & Educational system for the Wellbeing & welfare of our citizens (*1992 Republican Constitution of Ghana*)
- Economic and security challenges (*UN Millennium Development Goals & Beyond 2015*)
- Sustainable development of tertiary institutions (*ICT4AD Project, 2000 & 2003*)

KNUST, The Technical University

- **Vision**
 - Advancing knowledge in Science and Technology for sustainable development in Africa
- **Mission**
 - provide an environment for teaching, research and entrepreneurship training in Science and Technology for the industrial and socio-economic development of Ghana
- **Core values**
 - Leadership in Innovation and Technology
 - Culture of Excellence
 - Diversity and Equal Opportunity for All
 - Integrity and Stewardship of Resources

KNUST's Philosophy of Education

- Excellence
- Learner/student centered
- Problem-solving (Knowledge, skills, competencies)
- Entrepreneurial



The Challenge

cause & effects of the problem

- *Competency* issues
- *Approach* issues
- *Lack* of resources
- Policy-
Implementation *Gap*

The problem

*University teachers are **highly challenged in the application** knowledge, skills and competencies that make students and graduate able to cope with market demand*

Our Quests & Questions?

Quests

- To Identify PBL and its practices in KNUST
- To Determine theories for best practice of PBL
- To Determine some sustainable educational development strategies of PBL in KNUST
- To Establish PBL model mix that will sustain Development of KNUST's Tertiary education

Questions

- What is PBL and its practices in KNUST?
- what theories for best practice of PBL?
- What are some sustainable educational development strategies in KNUST?
- How does PBL model mix sustain Development of KNUST's Tertiary education?

Problem-based Learning

What is PBL

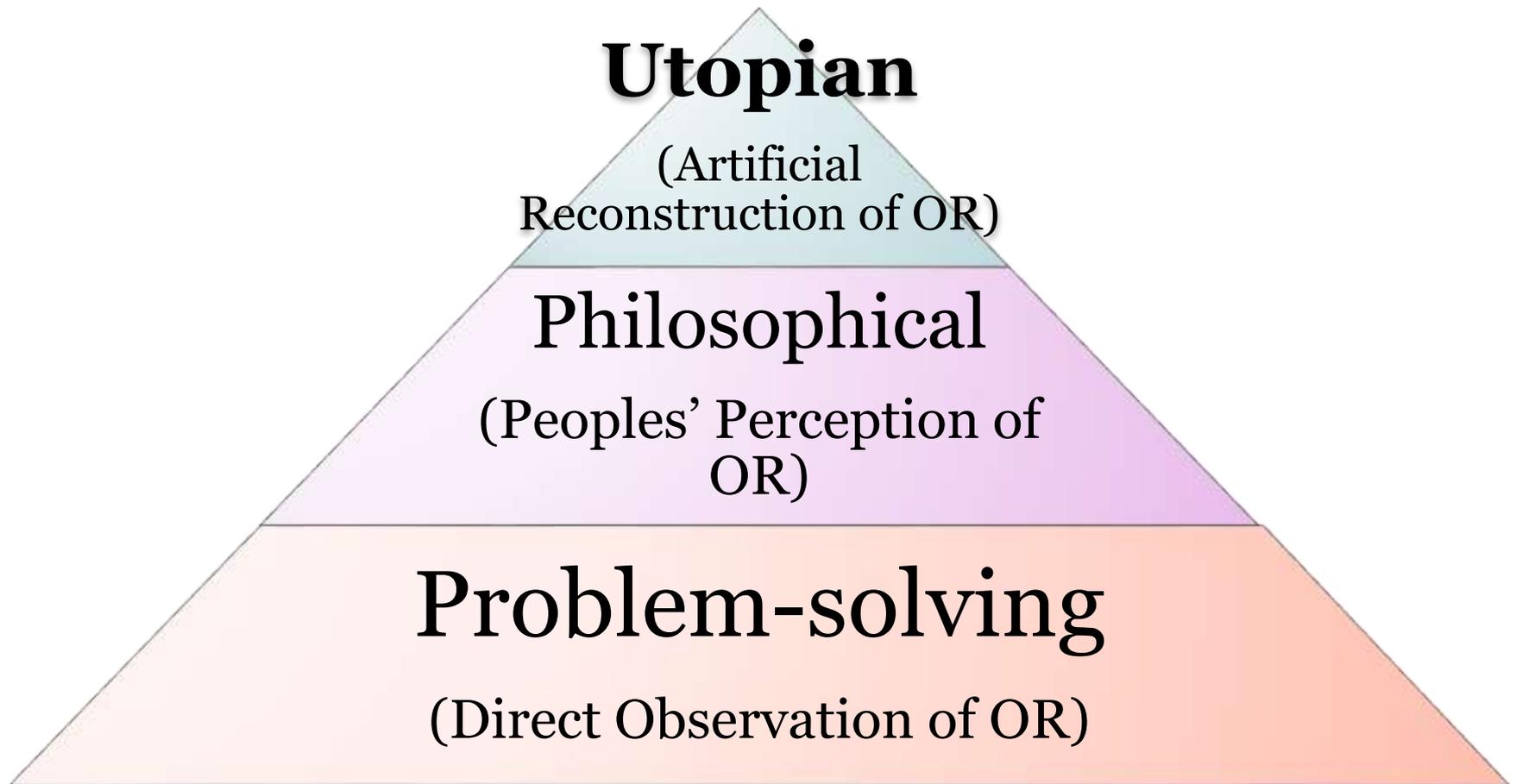
Why PBL in KNUST

The Model, the Methods, the Mix, and the Mastery

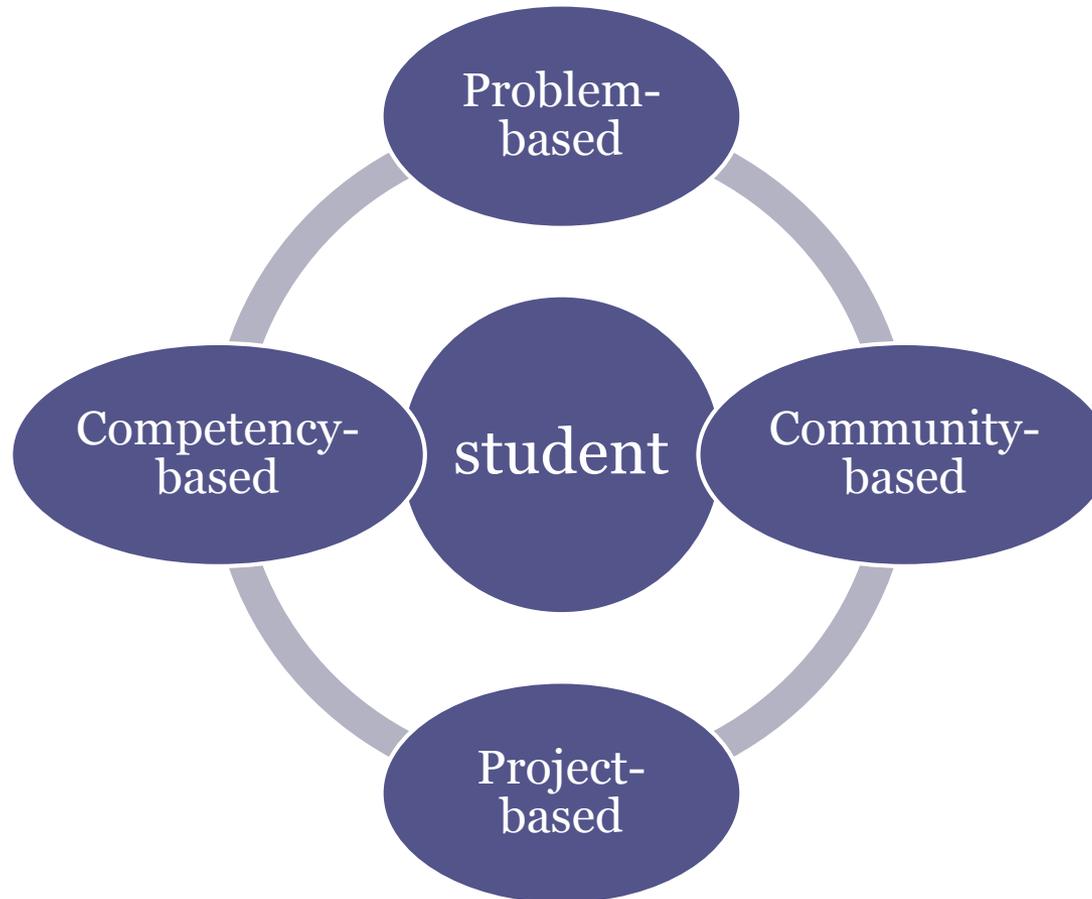
PBL what?

- Project based learning also known as problem based learning or inquiry based learning is a **current best practice in the teaching field**. Project based learning centers around the student seeking answers to **their own questions** through projects, hands on learning and performance.
- Open-ended problem is a problem that has several or many correct answers, and several ways to the correct answer(s).
- **Problem-based learning (PBL)** is a student-centered pedagogy in which students learn about a subject through the experience of solving an open-ended problem. Students learn both thinking strategies and domain knowledge.

Object Reality (OR) & Research (Adapted from Meridith et al, 1989)



The student & active learning



Learning Community (Wenger, 2000)

Community of practice

Community of interest

Task-based community

Knowledge-building community

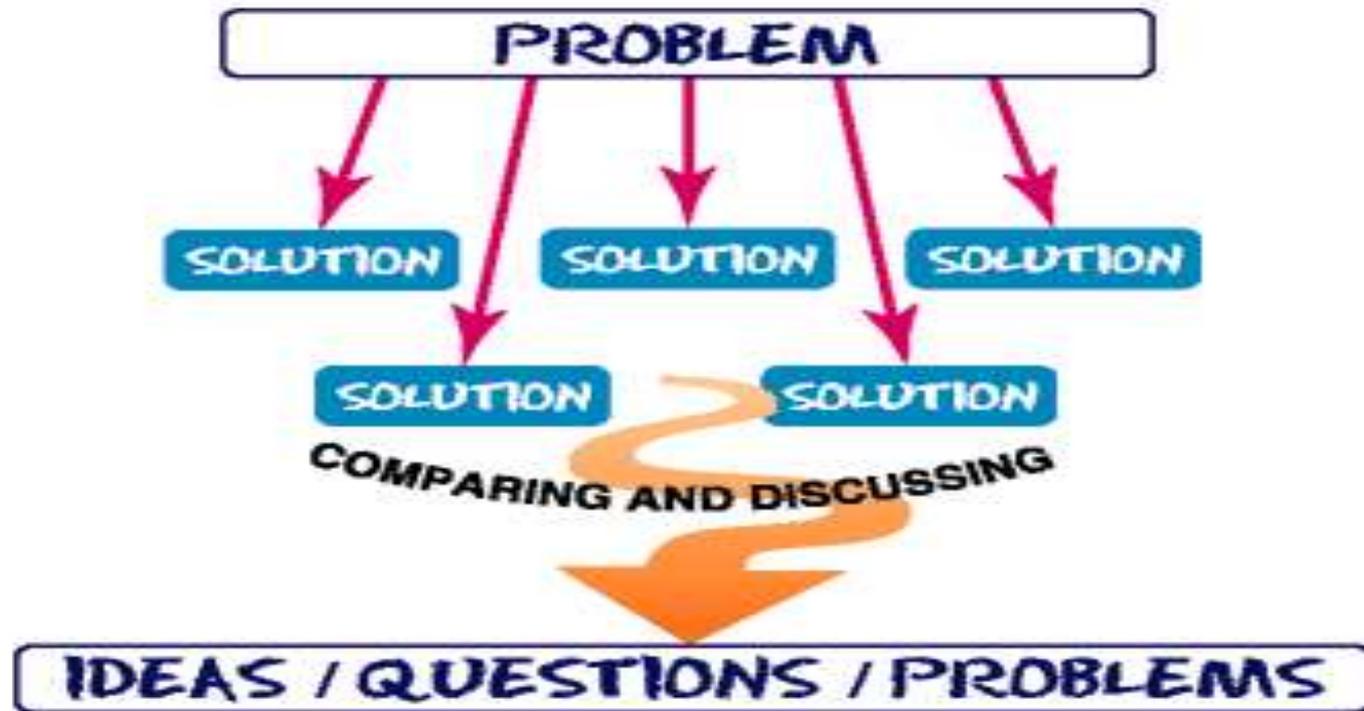
Webometrics.info (2015, to date)

University (position in country)	World ranking	Academia
Harvard , USA (1)	1	
MIT, USA (2)	2	
University of California, USA	52	PBL faculty institute
University of oxford, UK	13	
McMaster University, Medical school, Canada (10)	181	
University of Copenhagen, Denmark	86	
Aalborg University, Denmark,	268	PBL Academy
UG (1)	1757	
KNUST (2)	2081	

What problem are we to deal with:

- Closed ended problems:
 - Closed Ended Problems are the type with only one right answer. A closed-ended problem is a problem that only has one solution leading to one answer.
- Open ended problems:
 - SEVERAL WAYS TO MANY ANSWERS

Open-ended problem model (Shimada, 1997)



Great minds take a short at problem

- **“The formulation of a problem is often more essential than its solution, which may be merely a matter of mathematical or experimental skill”**. (Albert Einstein, 14 Mar 1879 - 18 Apr 1955) http://todayinsci.com/E/Einstein_Albert/EinsteinAlbert-Problem-Quotations.htm)
- **“Intellectuals solve problems, geniuses prevent them.”** (Albert Einstein, 1879-1955, <http://www.movemequotes.com/top-21-albert-einstein-quotes/>)
- **“Science ... never solves a problem without creating ten more.”** - George Bernard Shaw (1856 - 1950), Irish Playwright http://www.decision-making-solutions.com/problem_solving_quotes.html

The model, the method, the mix, & the mastery

- Models
- Methods
- The mix
- mastery

Models: Course based PBL- 1



Example:
Telecoms,
Makerere
University

Course based PBL - 2

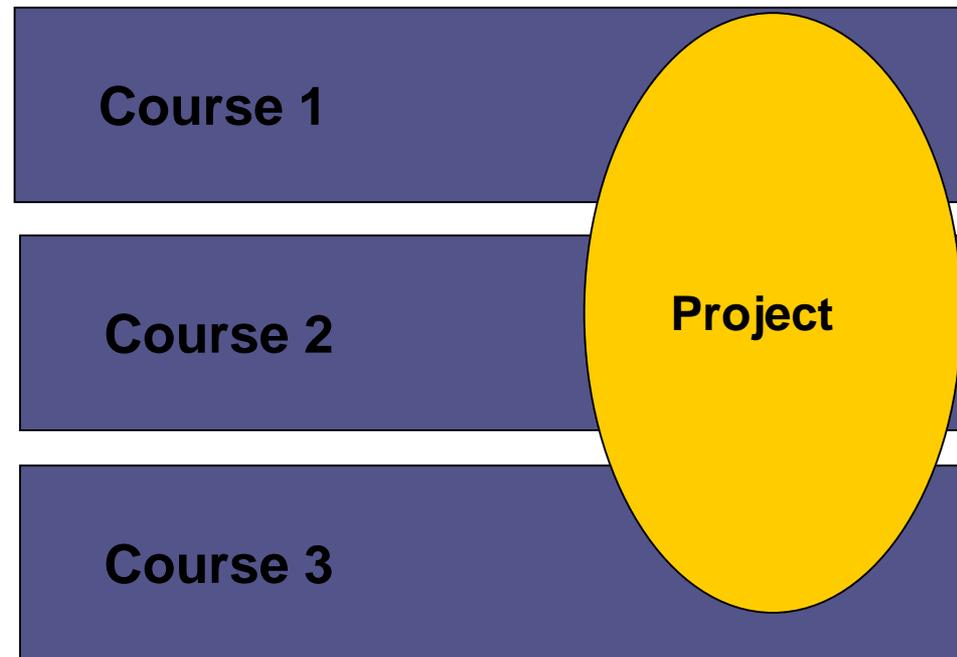
Project 1 Course 1

Project 2 Course 2

Project 3 Course 3

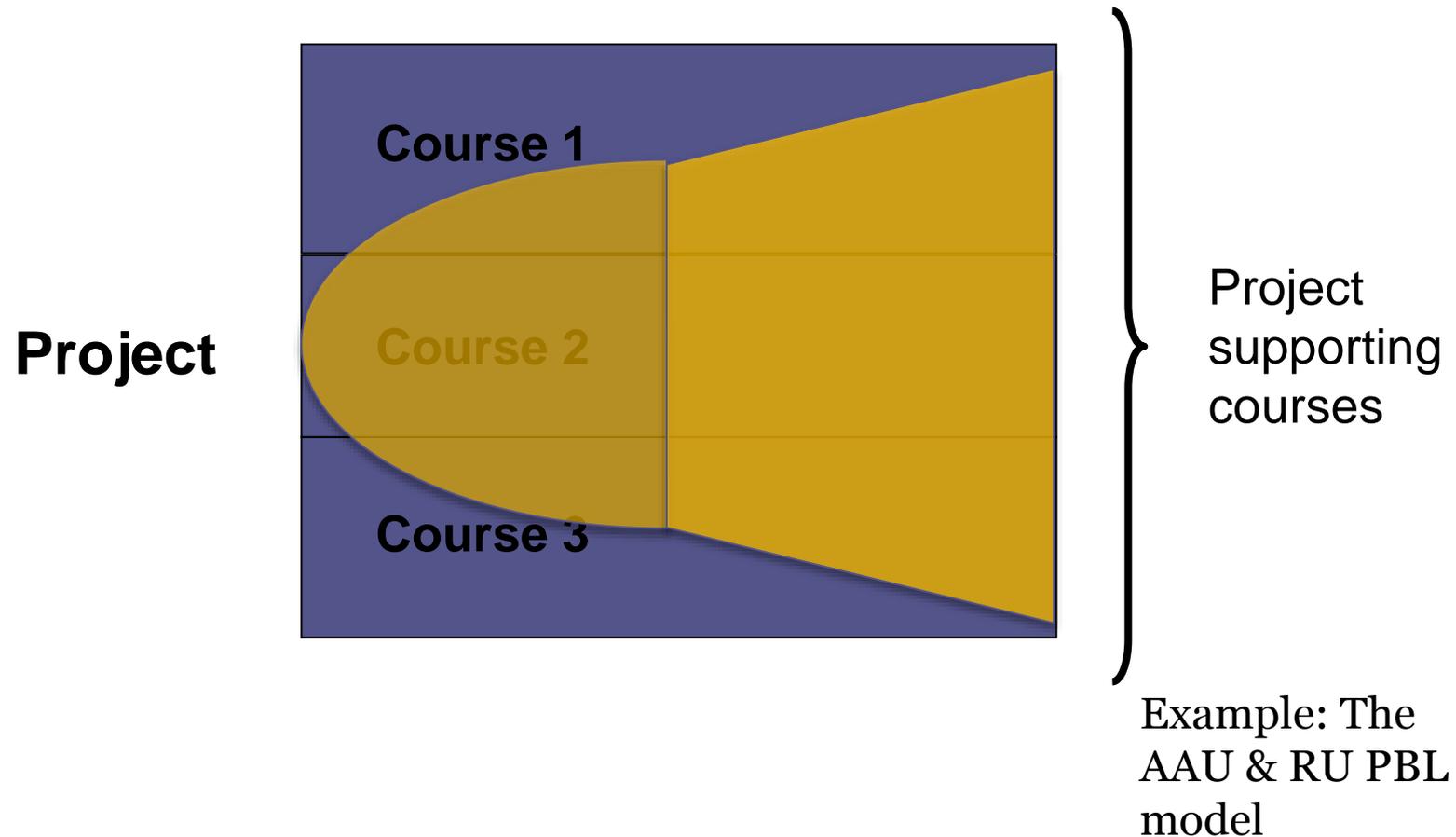
Example:
Business
management,
Medlin
University,
Colombia

Interdisciplinary Project BL



Example:
Mechanical
engineering,
KUITTHO,
Malaysia

Interdisciplinary project organised PBL



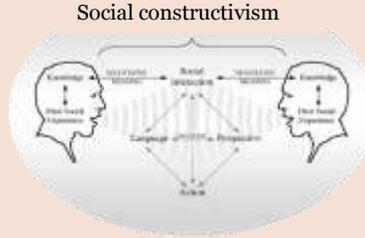
methods

- Facilitator
- Open ended problem (from industry, object reality)
- Brainstorm possible answers/open source
- Group work
- Individual work
- Presentation
- Individual Reports
- Vclass
- Convergence

Mix

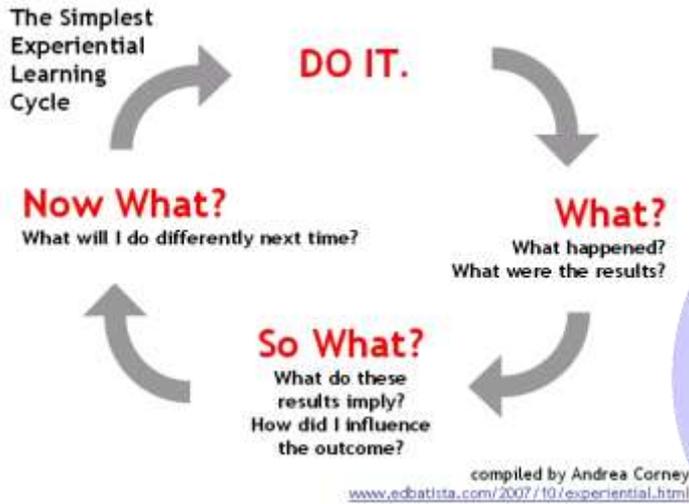
- Active learning (not passive)
 - Project-based techniques
 - Community-based techniques
 - Competency-based techniques
- Models
 - Project before-during-after course
 - Project embedded courses

Mastery Learning models

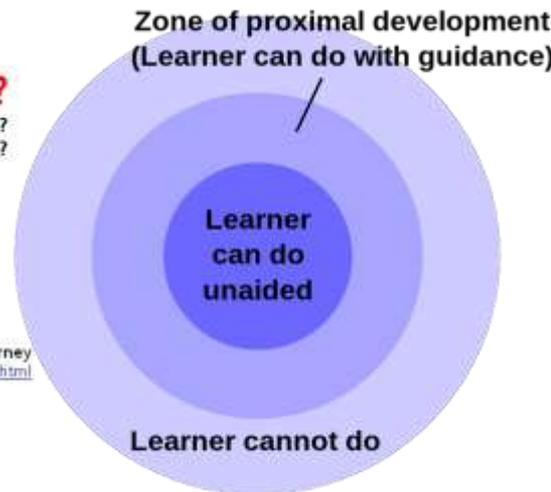


Centre for
Online and
Blended
Learning

Experimental learning, the Kolb cycle



Peer learning



Community of practice



PBL in KNUST

Problem based learning in COS

- To contribute to the resolution of national, environmental and poverty reduction problems ...
- Increase access to tertiary education through the e-learning mode
 - College of science handbook 2006-2010

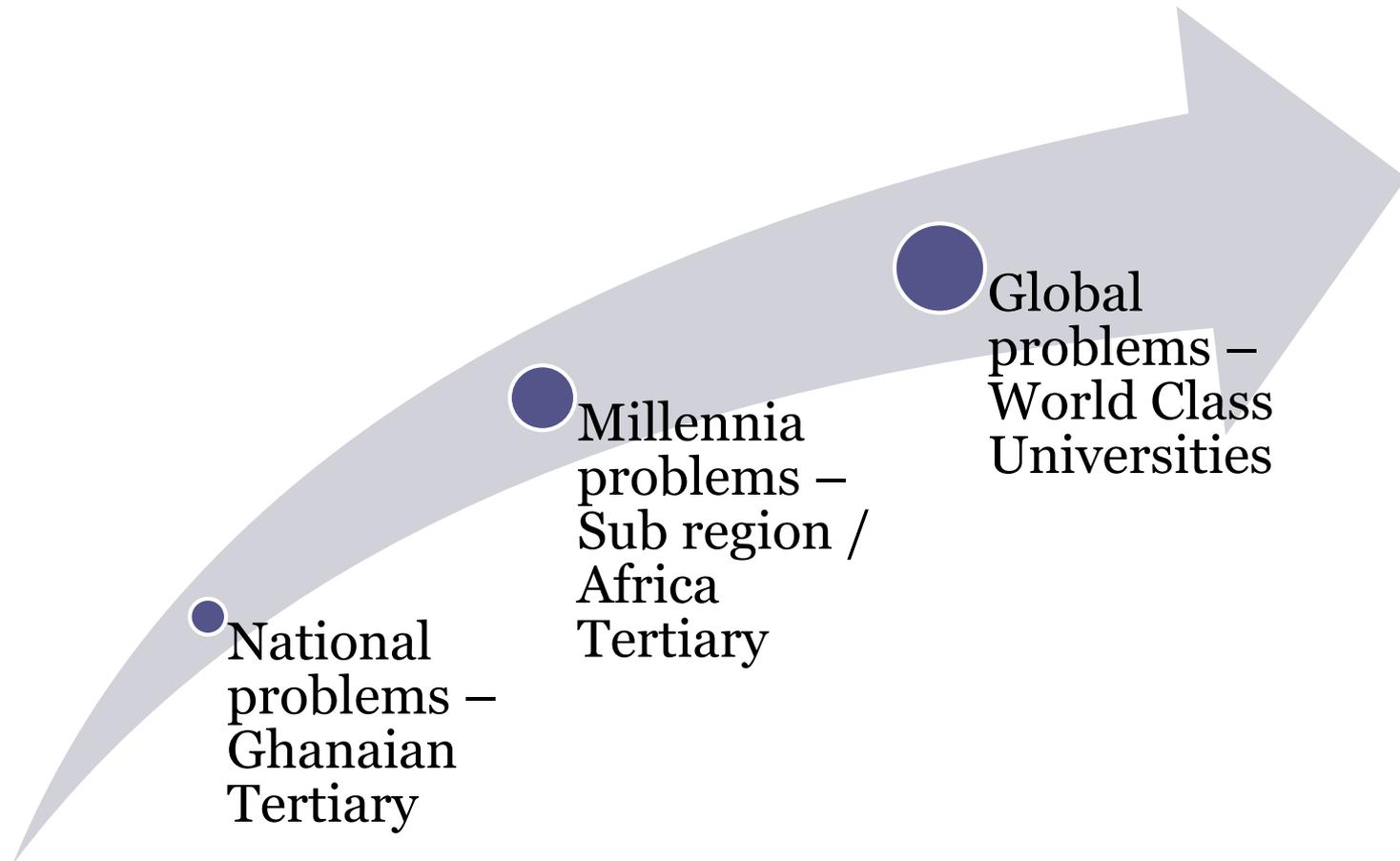
Learner centered distance and e-learning

- Problem based learning
 - Learning material
 - Study guide
 - Problem solving skills
 - Lectures become facilitators of the learning process & progress not the repository of knowledge
- Community of e-learners

College experience

- Institute Of Distance Learning
- College Of Build Environment
- College Of Humanities And Social Sciences
- College Of Engineering
- College Of Health Science
- College Of Science

Local Action with Global Impact!



PBL Open Doors for KNUST

Mandate

- *Since 1951 & 1961*
- Founding fathers
- Solve problems

DL mode

- *Since 2004*
- QCM Template
- E-learning platform

BSU I, II

- *2014/15*
- PBL-EL Project & policy objectives
- PBL UNESCO Co-Chair

New Brand

- *2015 & beyond*
- PBL-EL
- World class University

Reflections

- Decision
- Democratic
- Deliberate
- Developmental
- Doable

In conclusion

- PBL is in practice but not wide spread
- Curriculum/program specific
- Need of TQM
- Policy /institutionalize

Some Recommendations

- PBL Compliant & Branded University to enhance world class status & global marketability
- KNUST PBL-EL Policy give direction for teaching, research, service
- NAB PBL-EL Accreditation Guidelines for academic programs
- PBL Academy /IDL international collaborations, and academia for best practice

References

- Barrows, H. S. (1994), Practice-Based Learning: Problem-Based Learning Applied to Medical Education. Springfield, Ill: Southern Illinois University
- **The formulation of a problem is often more essential than its solution, which may be merely a matter of mathematical or experimental skill”..** (Albert Einstein, 14 Mar 1879 - 18 Apr 1955)
http://todayinsci.com/E/Einstein_Albert/EinsteinAlbert-Problem-Quotations.htm)
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Learning Track Activity

Q&A

Individual Work

Group Work

Q&A



- How can KNUST position itself with BPL–EL Branded world class University?
- How can we as university teachers & researchers provide a PBL experience for ourselves & our students?
- What educational philosophy do our university teachers have and are mentoring their students?

Individual/Group Work

- Define PBL.
- Describe PBL as a teaching/learning model,
- Identify and Explain the method of PBL
- How can a university teacher apply PBL is mix with other learner/student centered pedagogies
- Write out your action plan to help you gain your mastery of PBL skills

- Develop your Educational philosophy by which your teaching will be directed

Watch the following video presentation and discuss the respective concepts:

- problem based learning
https://youtu.be/lZS2MbxBGC_M
- Project based learning:
https://www.youtube.com/watch?v=hnzCGNnU_WM;
<https://www.youtube.com/watch?v=-OWX6KZQDoE>
- Competence based learning:
<https://www.youtube.com/watch?v=CKc7fkDiia8>
- Community based learning:
https://www.youtube.com/watch?v=TA1e2kz_adc

Facilitator



- *Head, Centre for E-learning Technologies, Institute of Distance Learning, Kwame Nkrumah University Of Science and Technology (KNUST), Kumasi, Ghana*
- *E-learning Practitioner, Instructional Designer & Trainer, Adult Learning Designer; and International Fellow, BILD, UK*
 - *Tel. : +233 24 466 7570 | +233 20 299 9484*
 - *email: alasaah@yahoo.com | aasaah.idl@knust.edu.gh*
 - *Website: <https://knust.academia.edu/ALASaah>*

Dr. Albert A. Saah, FBILD

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Thank
you