

The Implementation: A Scholarly Approach

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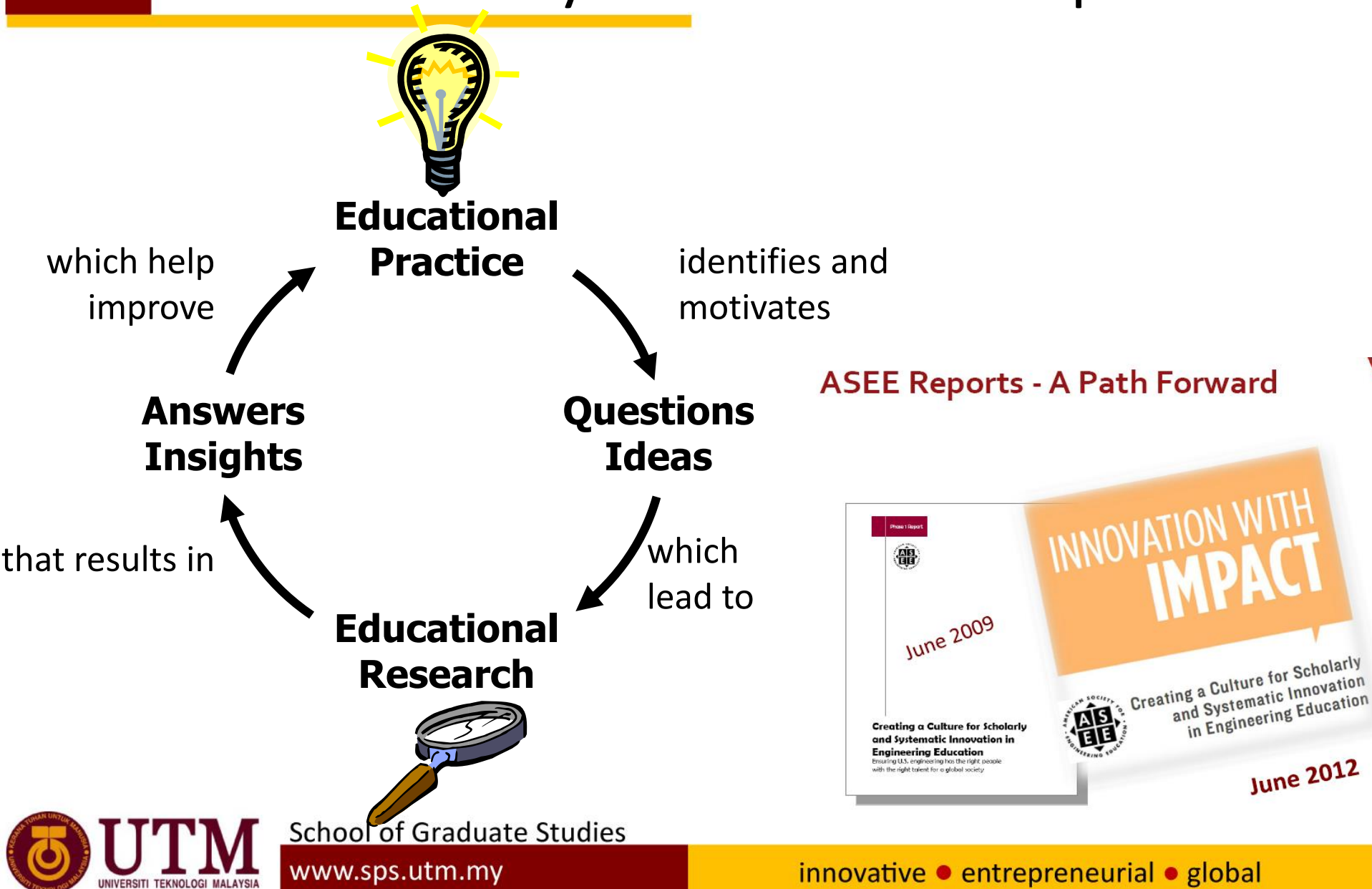
April 24, 2014

Outline

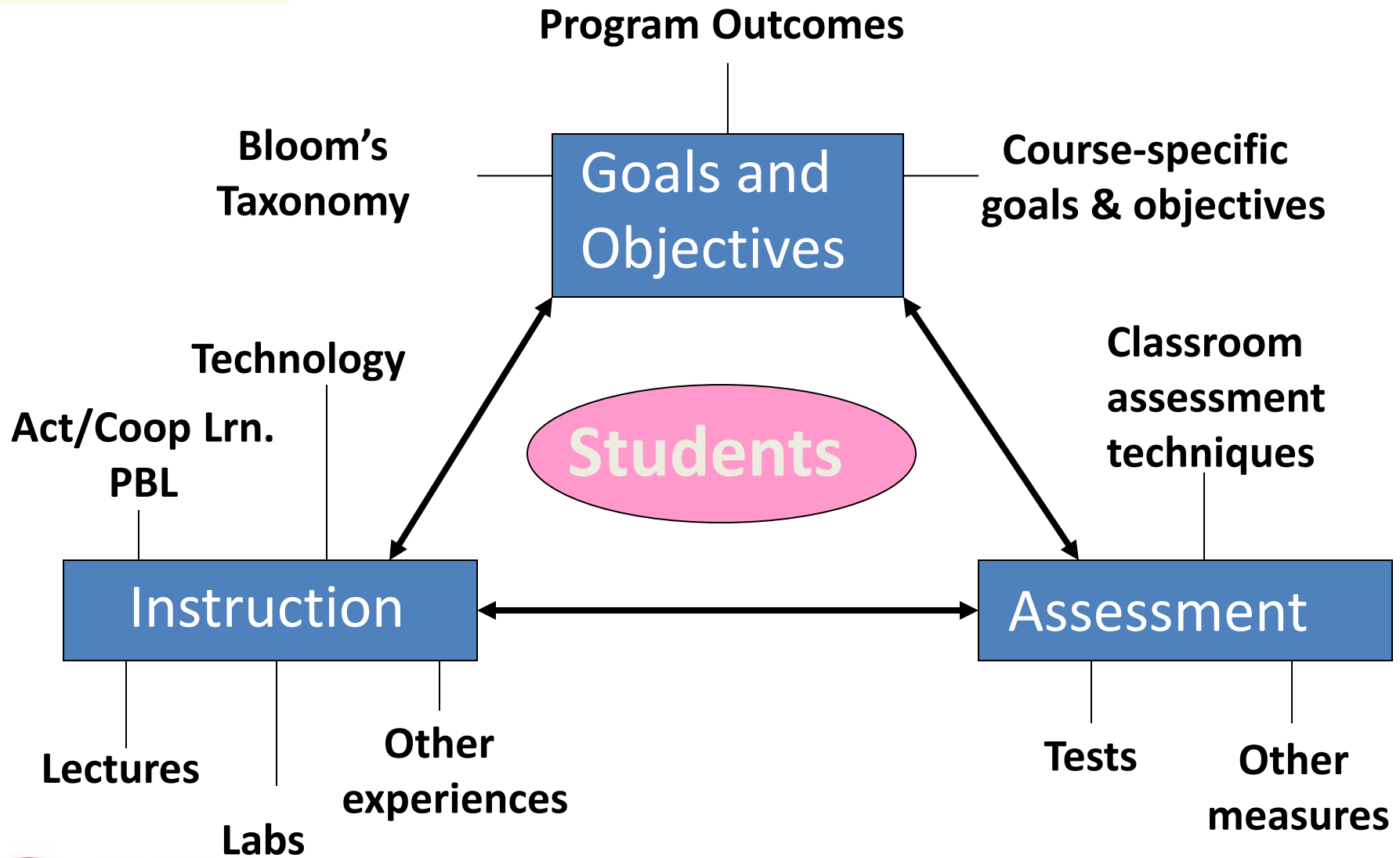
- What and Why ...?
- Underpinning principles for crafting problems
- Steps in problem crafting
- **How? Taking the scholarly approach**
- Example: Research on CPBL – impact and practical aspects

What does it mean to take a scholarly approach?

The virtuous cycle of research & practice



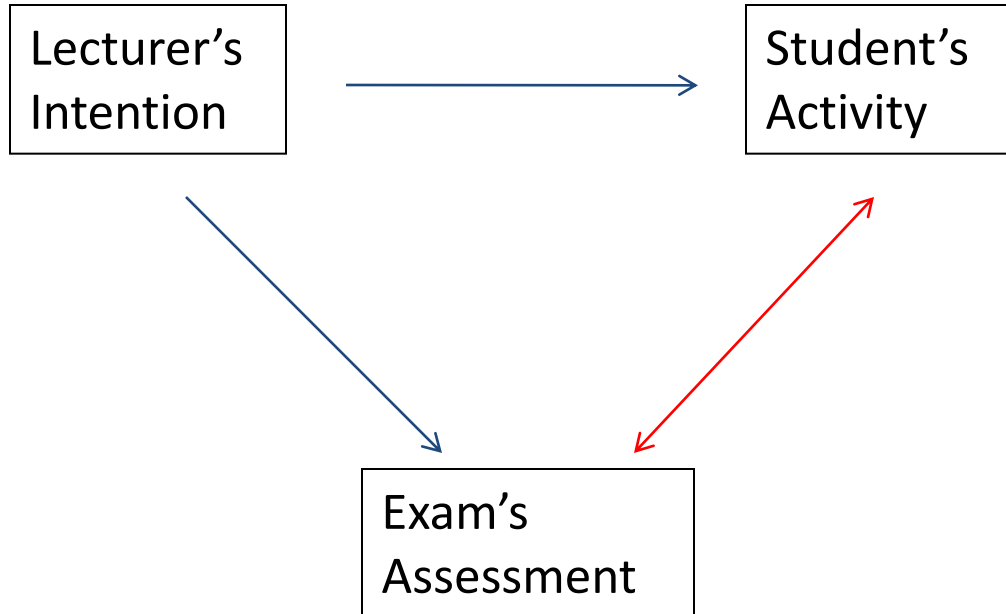
Effective Course Design under OBE – how can this framework help us in having complex problem solving skills as an outcome?



Constructive Alignment – John Biggs

Intended outcomes must clearly
be indicated

Activity will match
outcomes



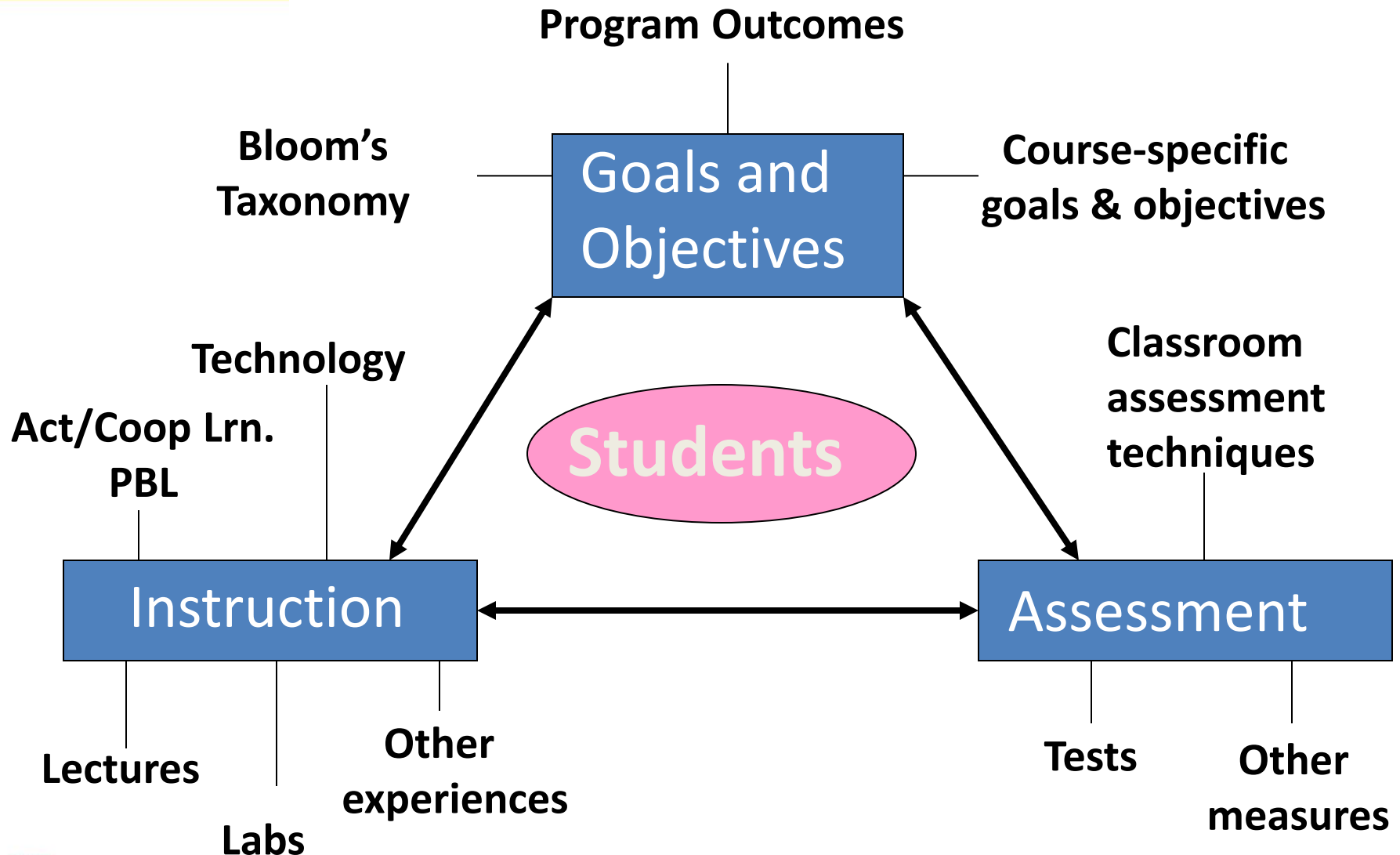
Assess intended outcomes

Mismatches between LO's and T&L activities

(John Cowan, 2nd UK workshop on Constructive Alignment, Jan 16 2008)

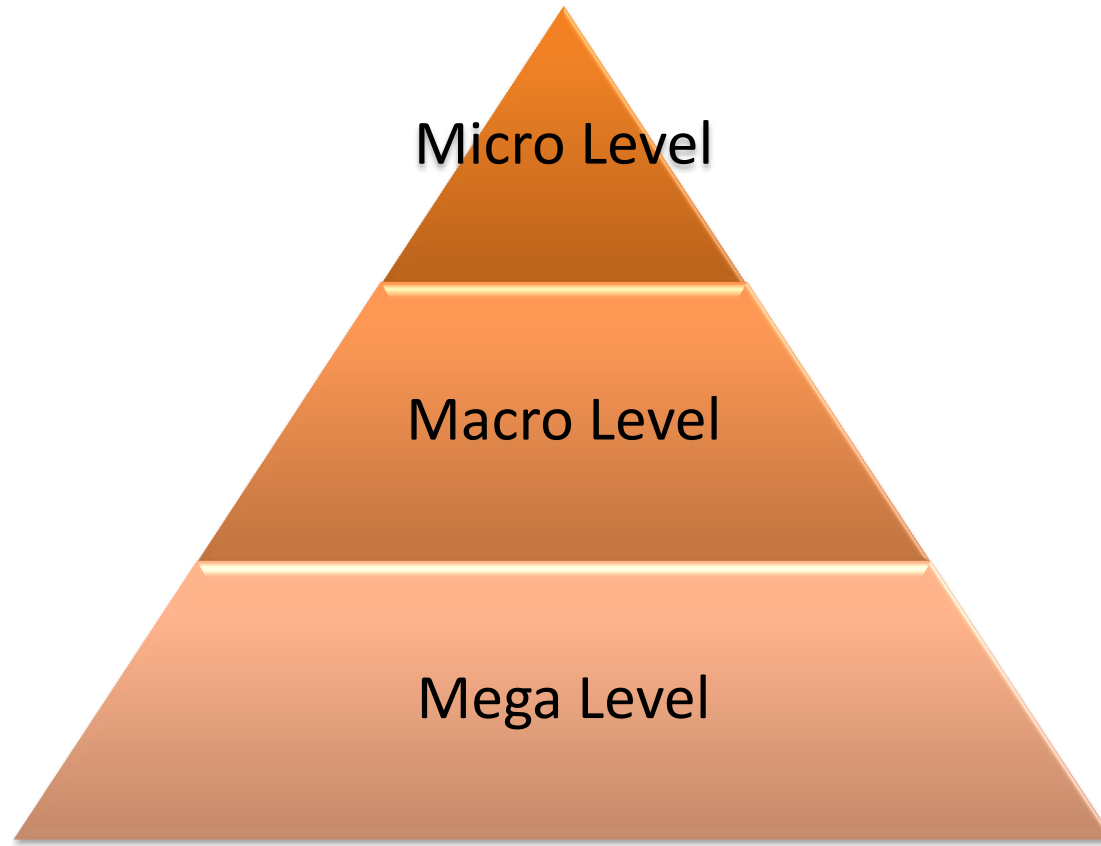
- “Students will develop their ability for creative problem-solving and design”
 - Activities simply called for these abilities to be used, without effort devoted in teaching for development


Keeping Constructive Alignment in mind— how can we attain complex problem solving skills as an outcome?



What types of teaching and learning technique can help develop complex problem solving skills? How do we make our choice which one to use?

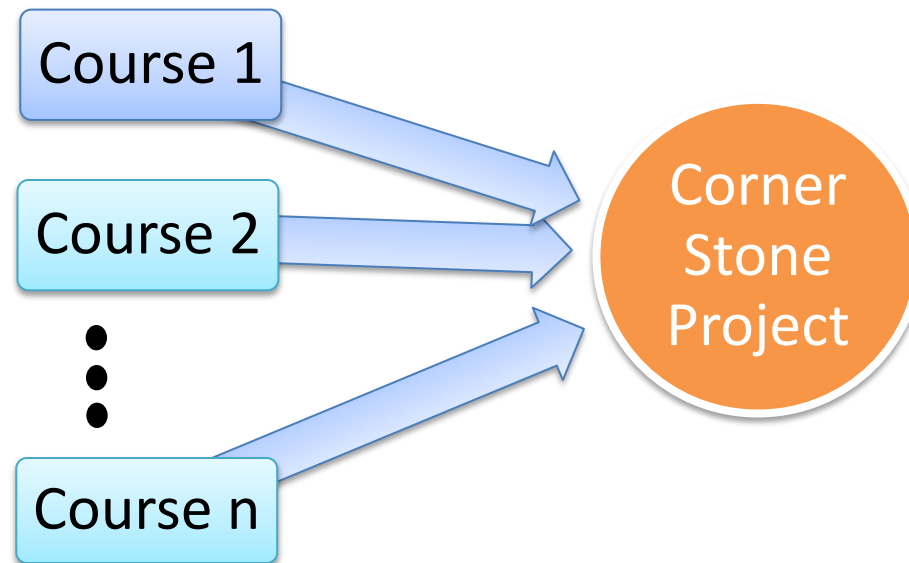
Different levels of curricula implementation



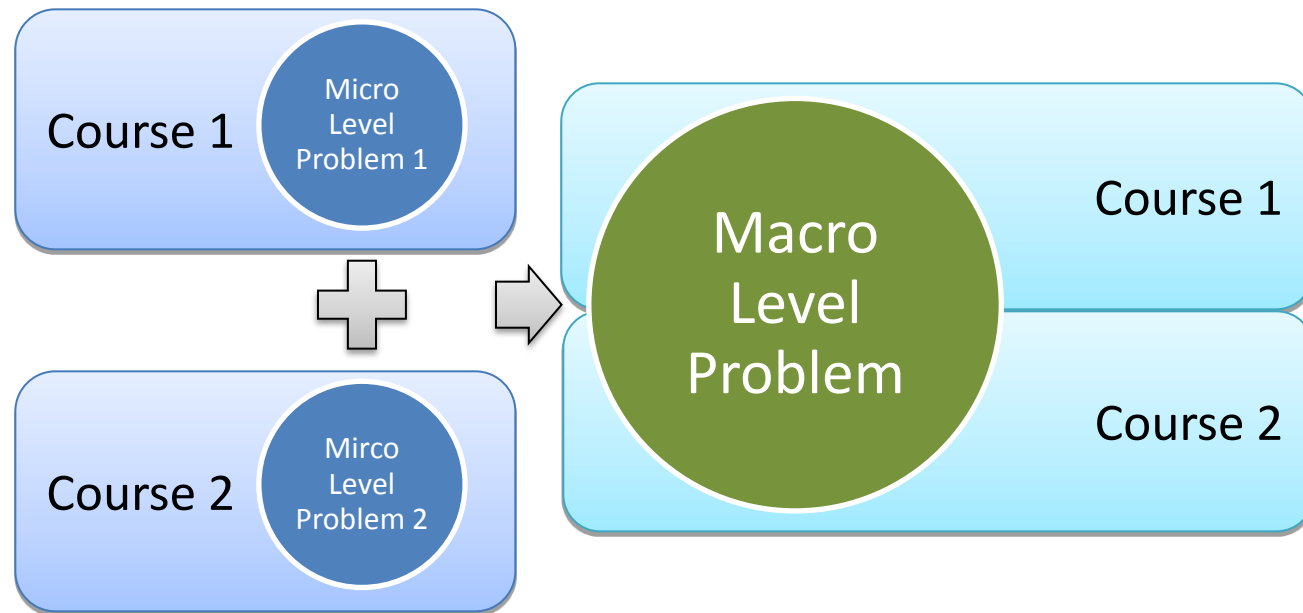


Different ways to integrate Problems & Projects

Macro Level Model A

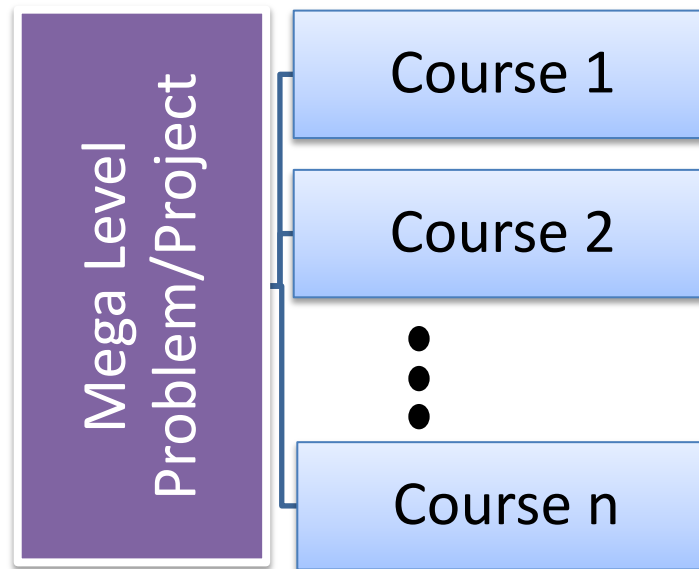



Macro Level Model B



What is the advantages and disadvantages between Macro Model A and Macro Model B?

Mega Level Implementation

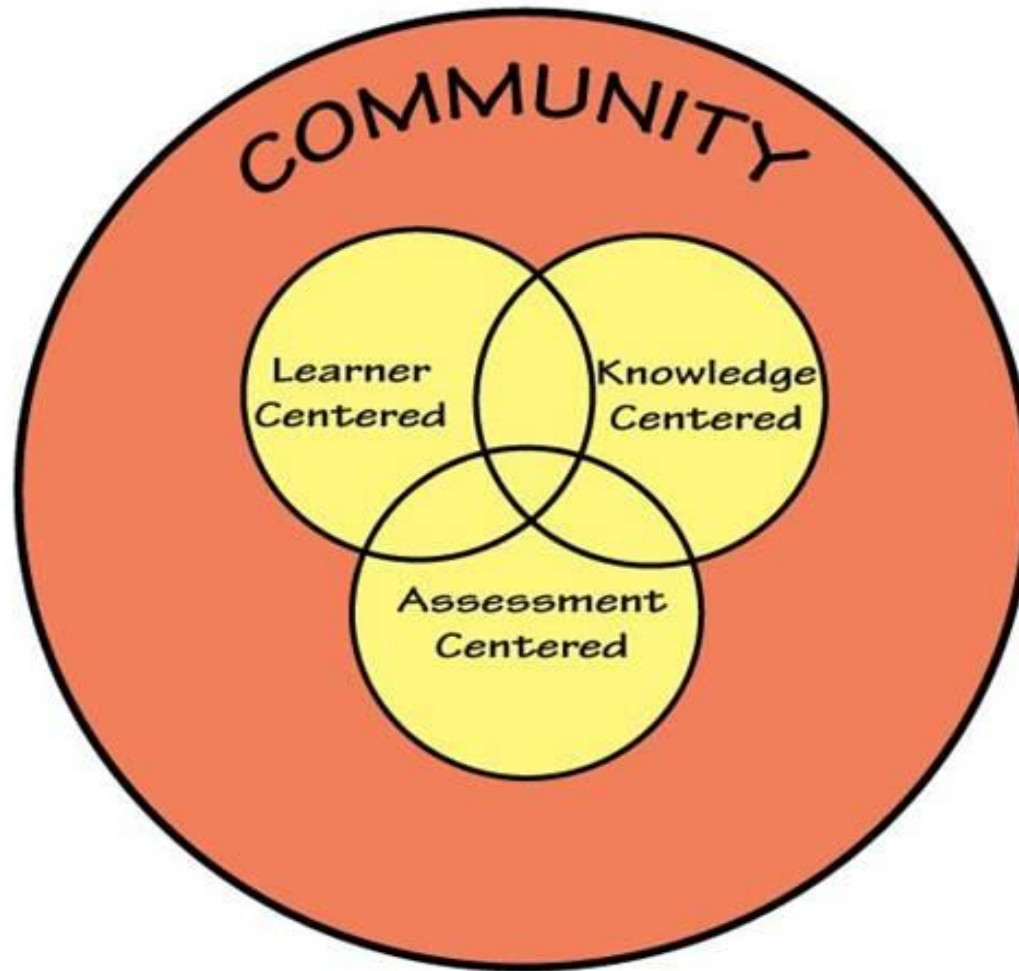




What about the problem?

Taking the scholarly approach, lets
consider the HPL framework ...

How People Learn (HPL) Framework (Bransford , 2003)



Sample

- ❑ **The scenario** – a team of third-year students who will be attending a *team interview for industrial training placements*
- ❑ **Mode of delivery** – *offer letter* for interview session from a petrochemical company

Polystyrene (M) Sdn. Bhd.

www.polystyrenemalaysia.com

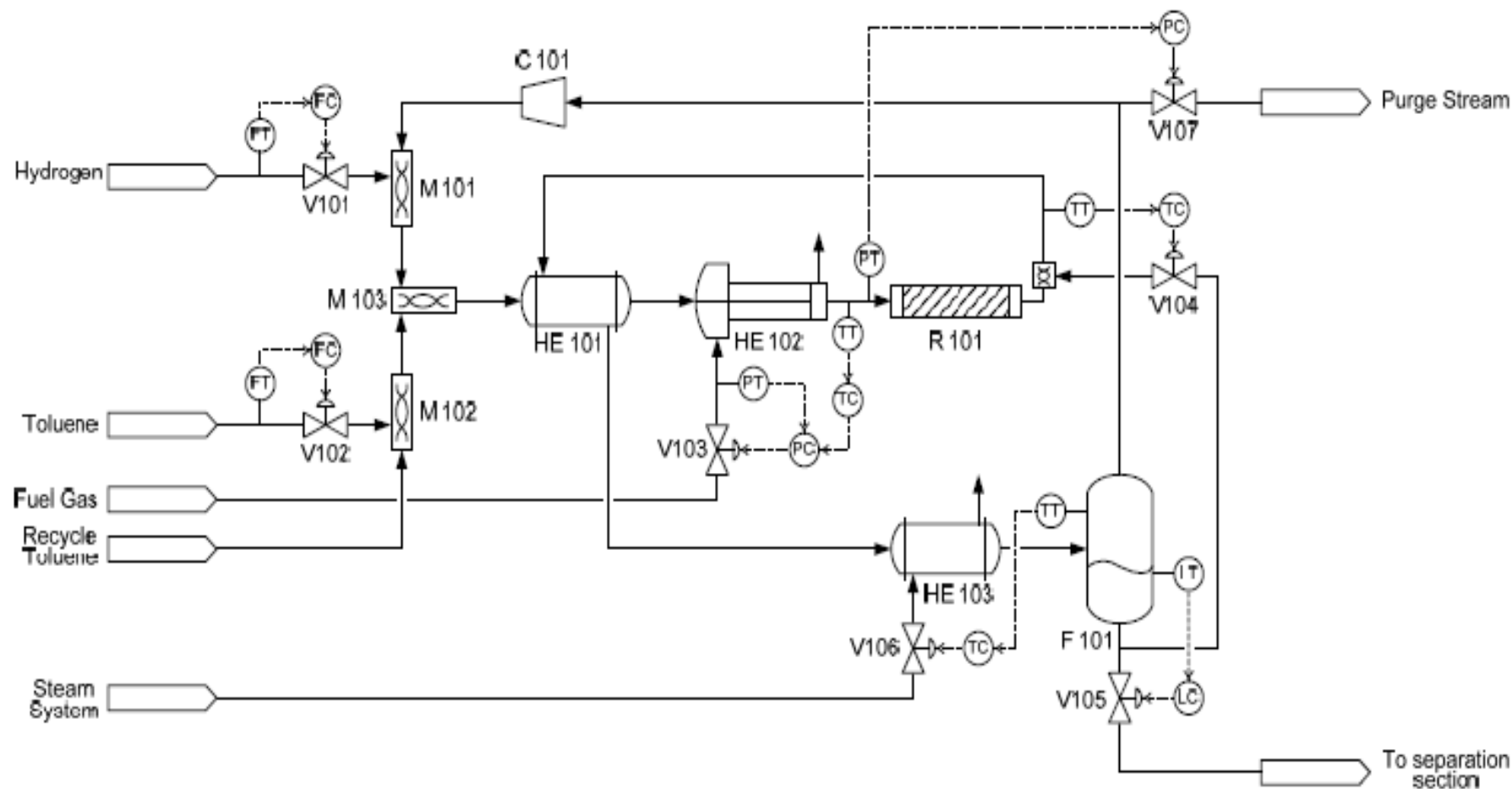
PLO 4225, Jalan Perdana 3/5,
81700 Pasir Gudang, Johor.

Tel: +607-8508290
Fax: +607-8508291

Dear candidates,

The selection committee of Polystyrene (M) Sdn. Bhd. is very interested in interviewing your team for the opportunity to undergo industrial training at our company. The interview session is scheduled on 28th December 2009, from 10 a.m. to 12 noon, in the meeting room, Human Resource Department, Polystyrene (M) Sdn. Bhd.

With regards to the interview session, we would like you to demonstrate your understanding on one of our processing plants, the HDA Process, in a 3-5 page report. Please systematically describe the process from a system's point of view. Be sure to include the input and output variables involved in the process. Explain all the automatic control systems: classify the variables, identify the control objective, and identify the control configuration used for each control loop. Please comment if the control configurations used are sufficient to tackle the disturbances. Enclosed are the process description and a simplified P&ID of the HDA Process for your reference.



DRAWING OWNED BY:

PSM
Polystyrene (M) Sdn. Bhd.

PROJECT/PROCESS:

Hydrodealkylation of
Toluene to Benzene
(HDA Process)

PIPING & INSTRUMENTATION DIAGRAM (P&ID):

HDA Process (SECTION 01: REACTOR & FLASH VESSEL)

Scale:

NTS

Drawn:

Iqbal Ridha

Drawing No.:

HDA.Plant/SN01/R101_V101

Date:

10th Dec 2009

Figure 1: HDA Process

CASE STUDY 3: Part 1

HDA Process at Polystyrene (M) Sdn. Bhd.

The Scenario

You have just graduated from UTM. Because of your excellent results (especially in your Process Control and Dynamics course), excellent performance during industrial training and credentials, you are hired and assigned to work with a control engineering and troubleshooting team of Polystyrene (M) Sdn. Bhd.. Since you have just been hired and are still under probation, you are not allowed to take any leave for three months and thus only have four days break for the Chinese New Year holidays.

Once Wednesday afternoon, while everybody was enthusiastically chatting on their preparation and planning for the Chinese New Year holidays, your mail box beeped, and you received the following message from the team leader:

[Reply](#)[Reply all](#)[Forward](#)[Delete](#)[Print](#)[Back](#)[Next](#)

To: Control Eng. & Troubleshooting Team <control.team@psm.my>

From: Iqbal Ridha <iqbal.ridha@psm.my>

Date: 03/02/2010 04:00 PM

Attachments: drum_layout.jpg

Subject: Analysis of PID controllers & feedback control loops

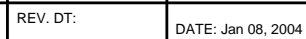
Dear engineers,


In the next few weeks, we're going to start replacing all the control valves utilized in the HDA Plant with the new ones as part of our standard maintenance and safety procedure, since the last replacement 5 years ago. The control valves need to be replaced regularly due to corrosion, which can lead to loss in production capacity, occasional plant trip and frequent maintenance. Bear in mind that we're dealing with hazardous chemicals: toluene and benzene. Now, once all the control valves are installed, they need to be re-tuned to ensure the best response of the controller, according to our operating conditions. Therefore, I want each one of you to be well prepared before the work begins, especially with regard to controller tuning, as you don't any experience in this kind of task.

To start you off, I want you to study the behavior of the feedback control system for the HDA Plant. Since this is your first time, I want you to concentrate on the heat exchanger and the flash drum only – temperature and level control loops. First of all, I want to see your understanding on the behaviors and characteristics of all feedback controller modes in a 3-page progress report. Include any appropriate diagrams to aid your explanation. Then, I want you to develop the feedback control block diagram for each of the control loops,



Finally, a real problem...





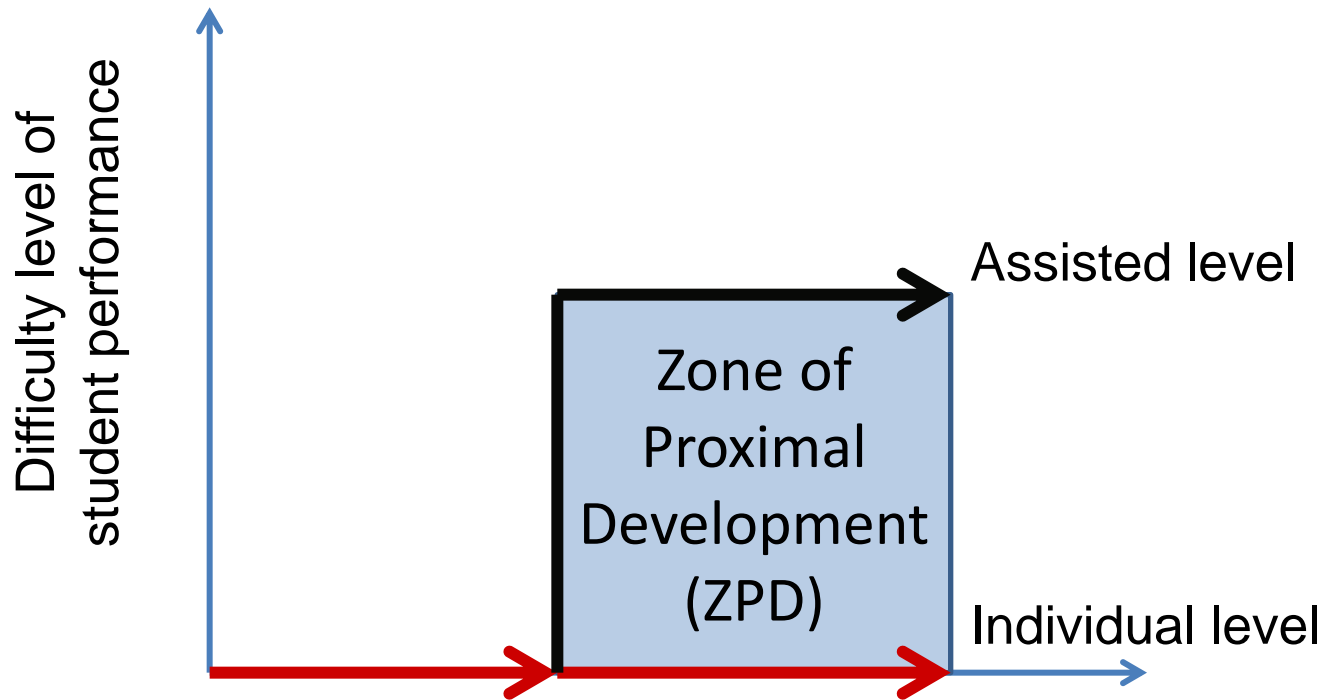
Now that we have the problem, can we just give it to students, leave them alone and expect them to solve it well? How to support them (keeping in mind that we want to take a scholarly approach) to attain complex skills?

If life-long learning skill is desired...

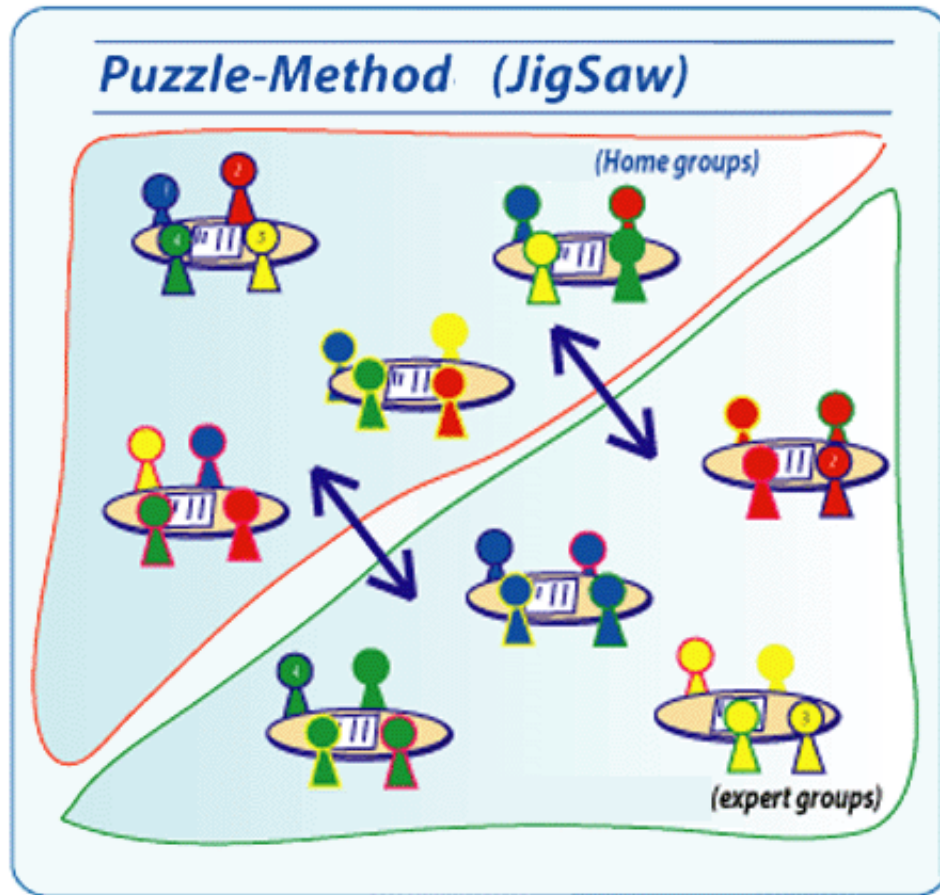
- Option 1: ask students to read certain topics on their own, and write a report / give a presentation / ask question during examination

Is this effective?

Add scaffolding to support student learning

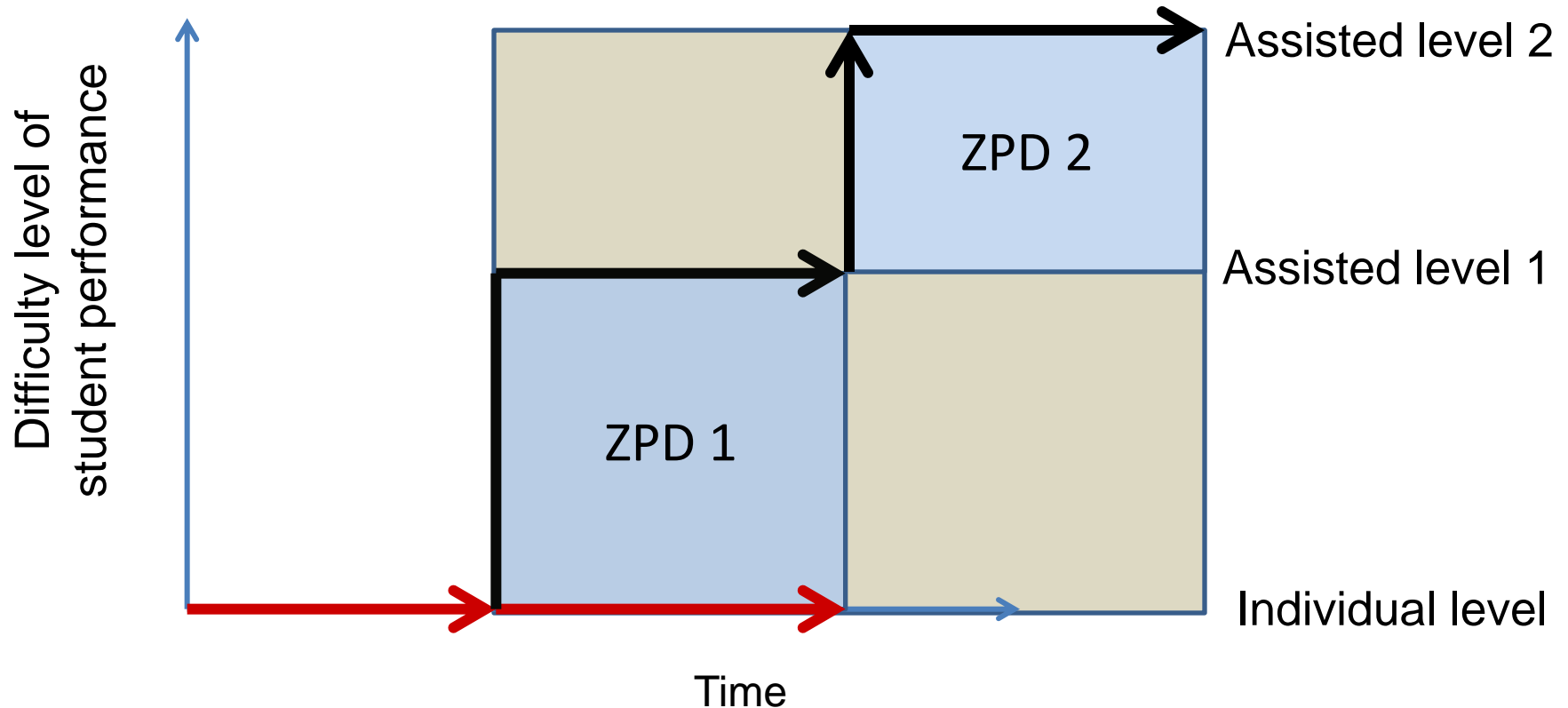


Can we give support to better achieve the outcomes of life-long learning?



Option 2:
Use a formal Cooperative
Learning Method –
The Jigsaw Activity

Add scaffolding to support student learning



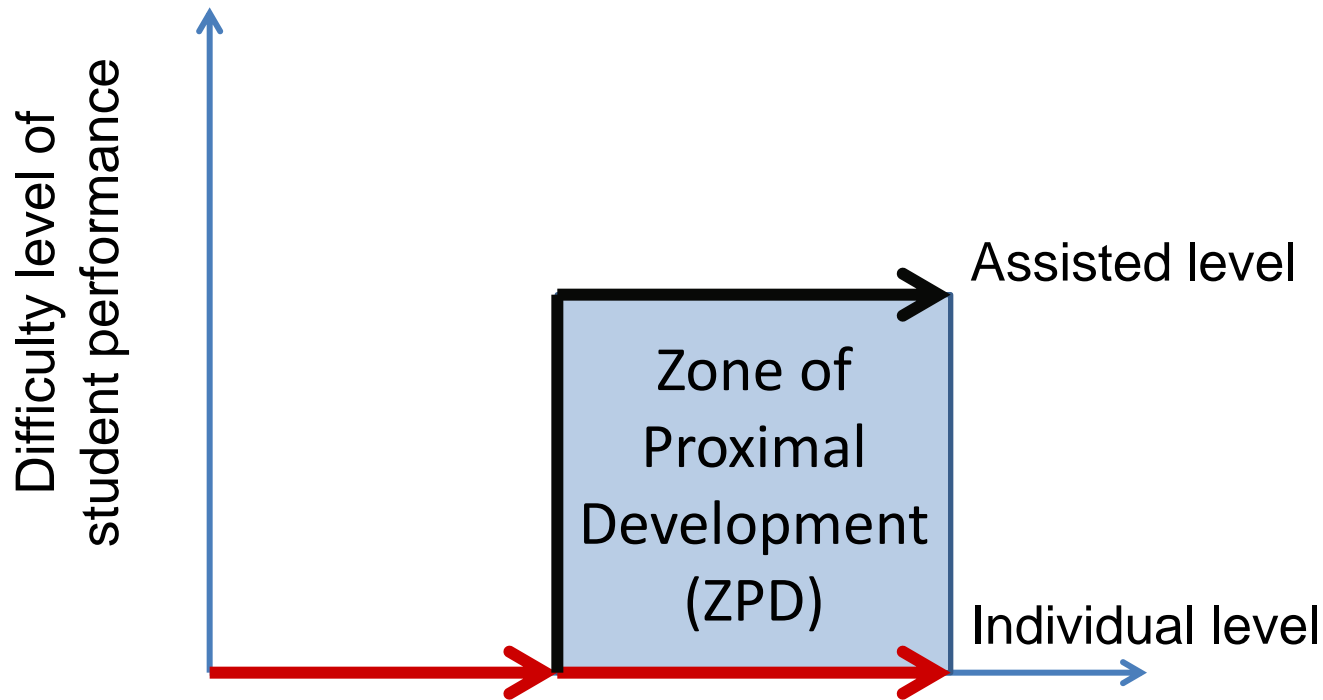
Providing Support for Developing Life-long Learning Skills

- Start with simple topics/content
- Develop major sub-skills
 - Reading and extracting information
 - Note-making, summarizing
 - Discussion skills
 - Thinking skills
- Provide feedback
- Tools for self assessment
- Reinforce with more difficult topics
- Give assignment/project that will require use of skills



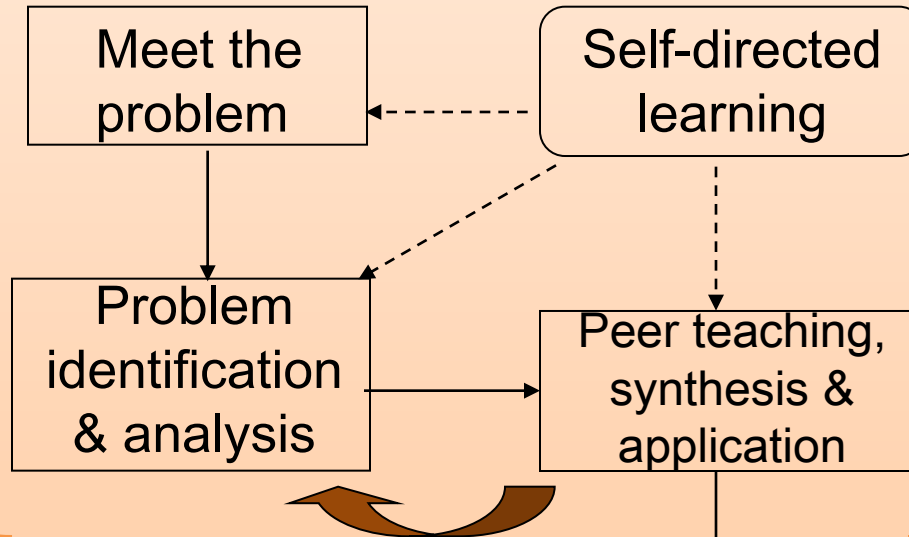
How can we support more complex skills like problem solving?

Add scaffolding to support student learning



The PBL Process

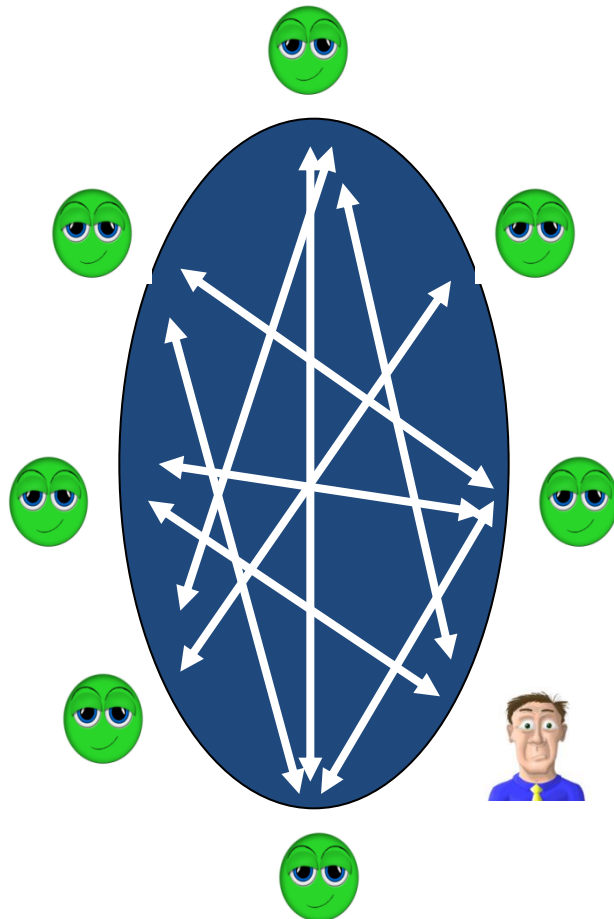
Phase 1



Phase 2

Phase 3


Medical School Model



Typical course implementation

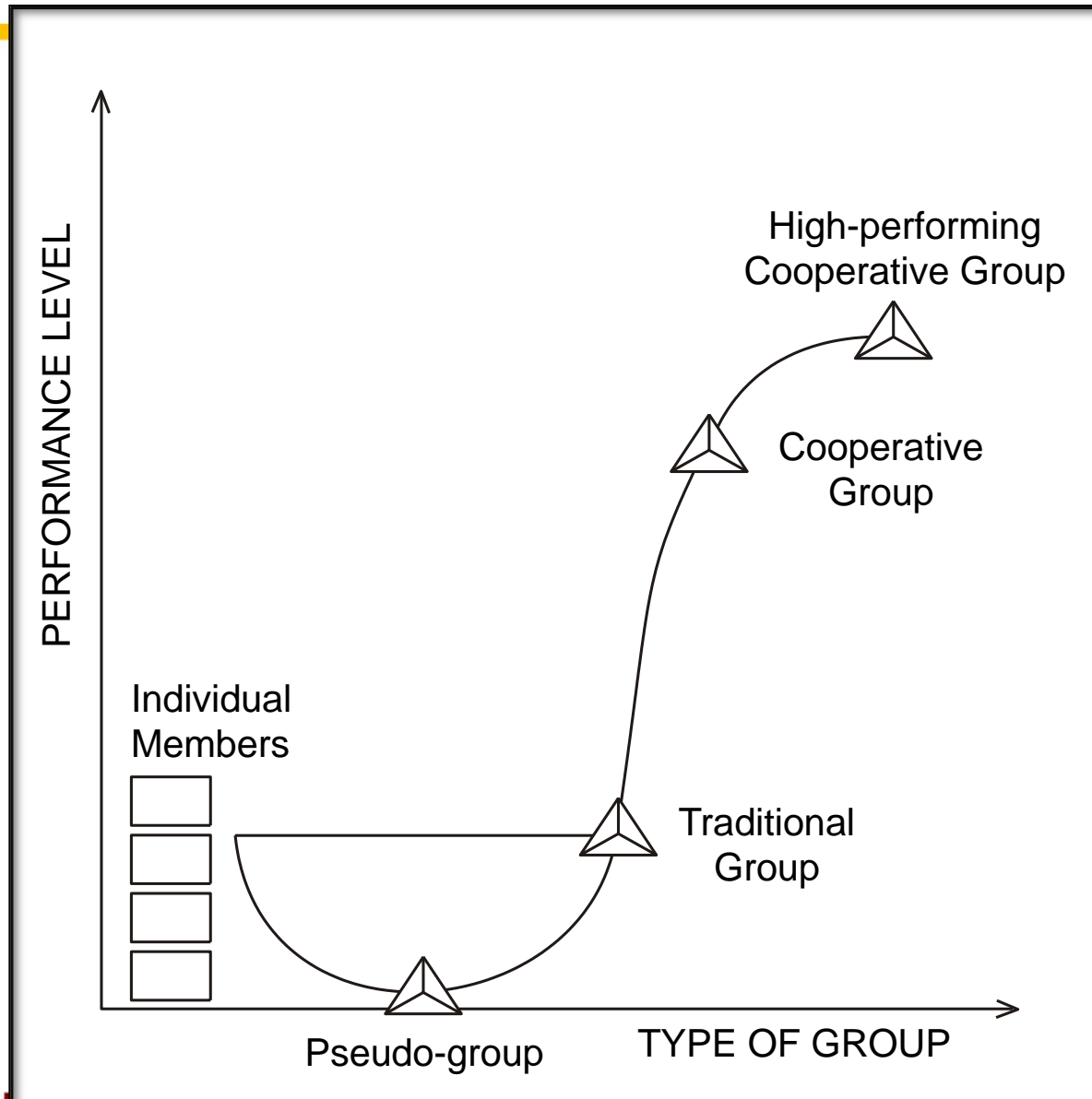


Small groups in a
medium/large class
using a floating facilitator

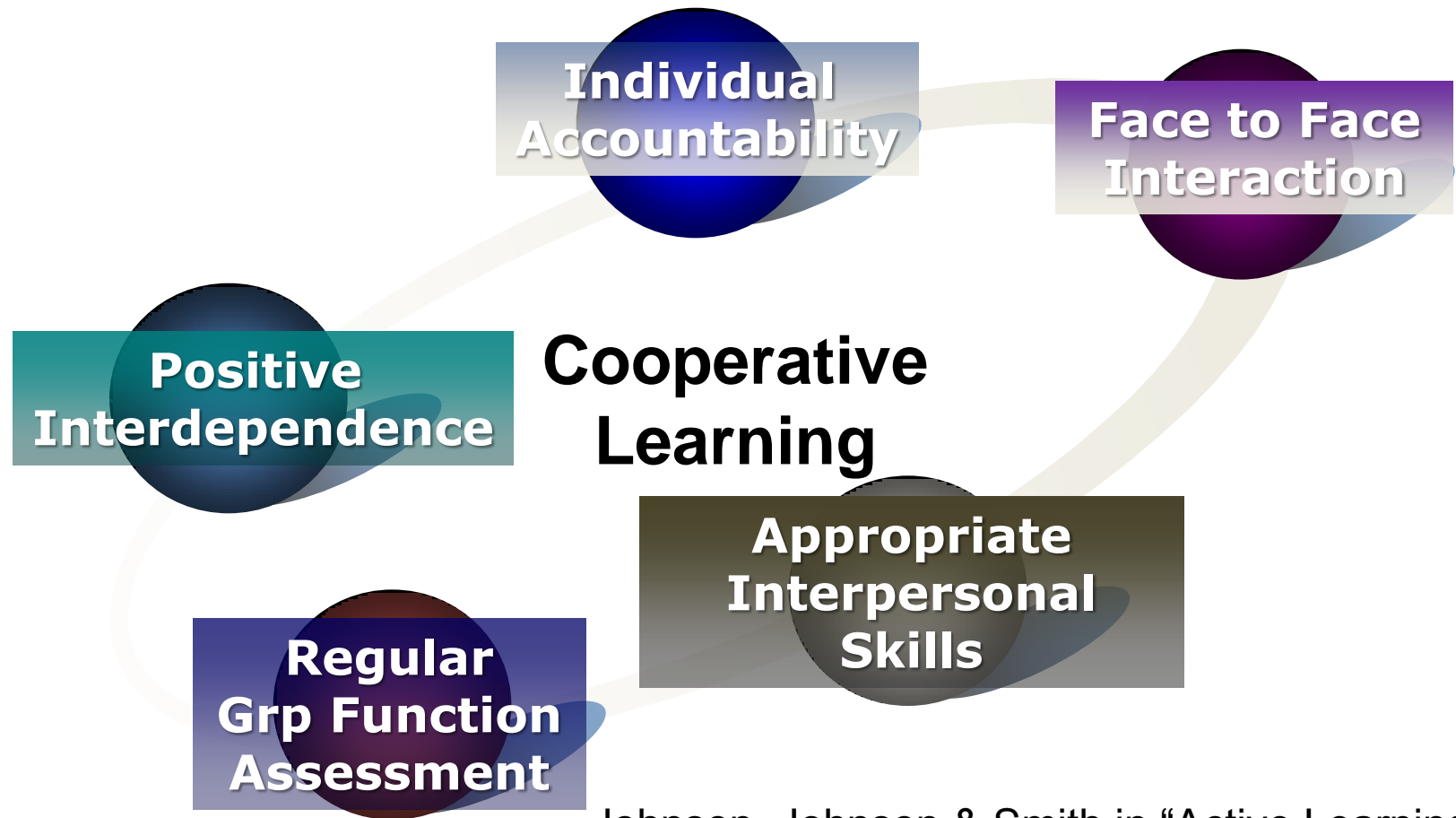


What normally happens when we
assign students into groups to learn?

Performance Level of a Group (K. Smith, 2007)



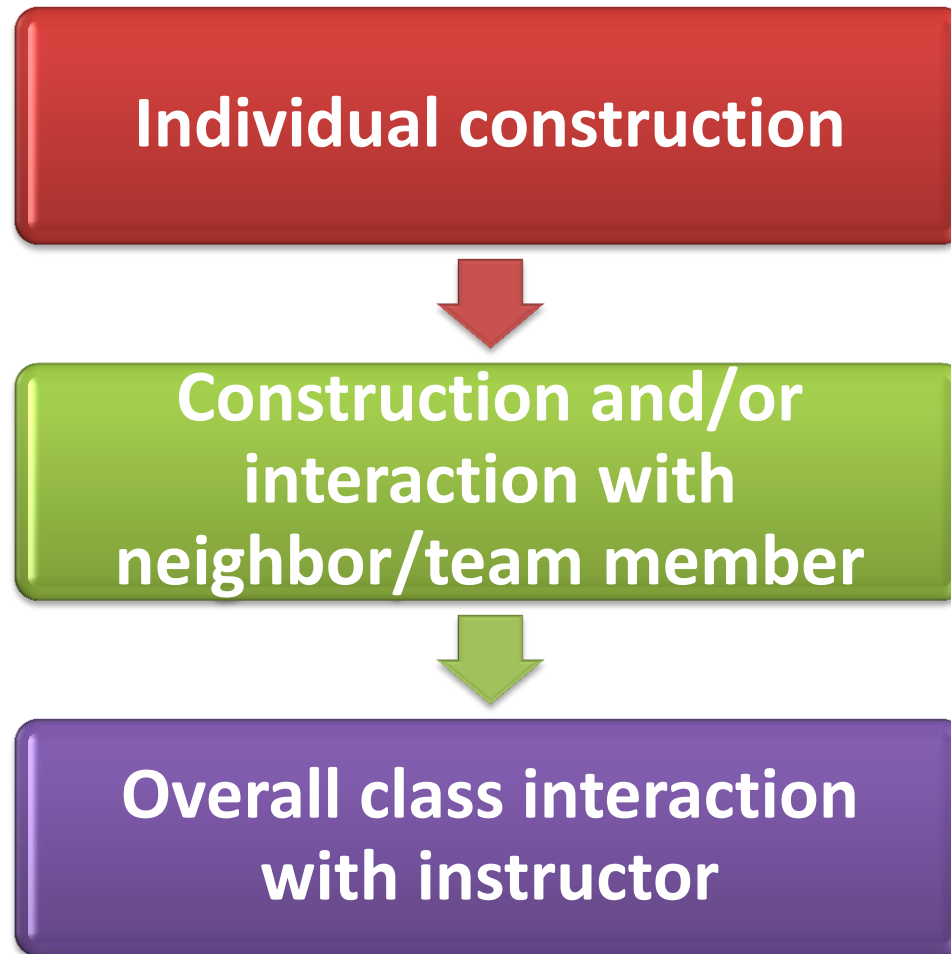
Principles of Cooperative Learning



Johnson, Johnson & Smith in "Active Learning: Cooperation in the College Classroom", 2006

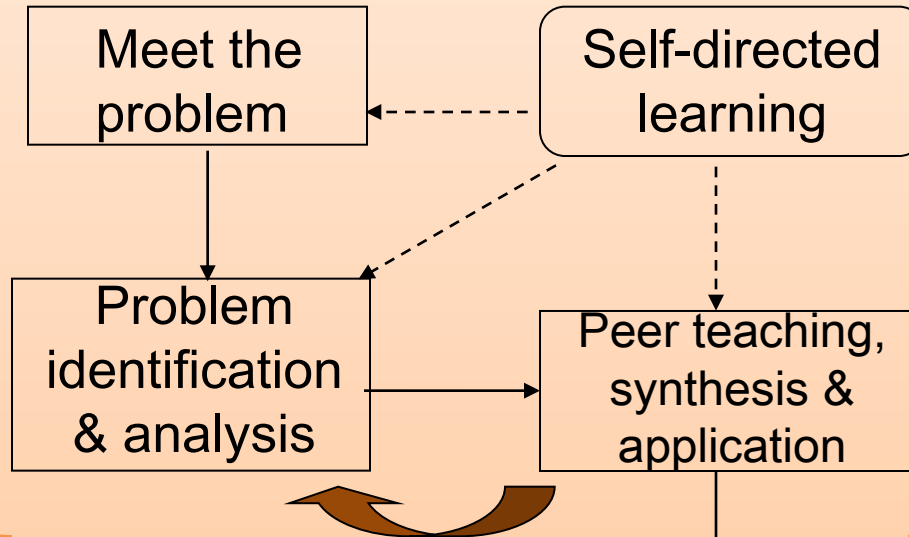
Pattern in CL Activities

Involves everyone in the
class!



The PBL Process

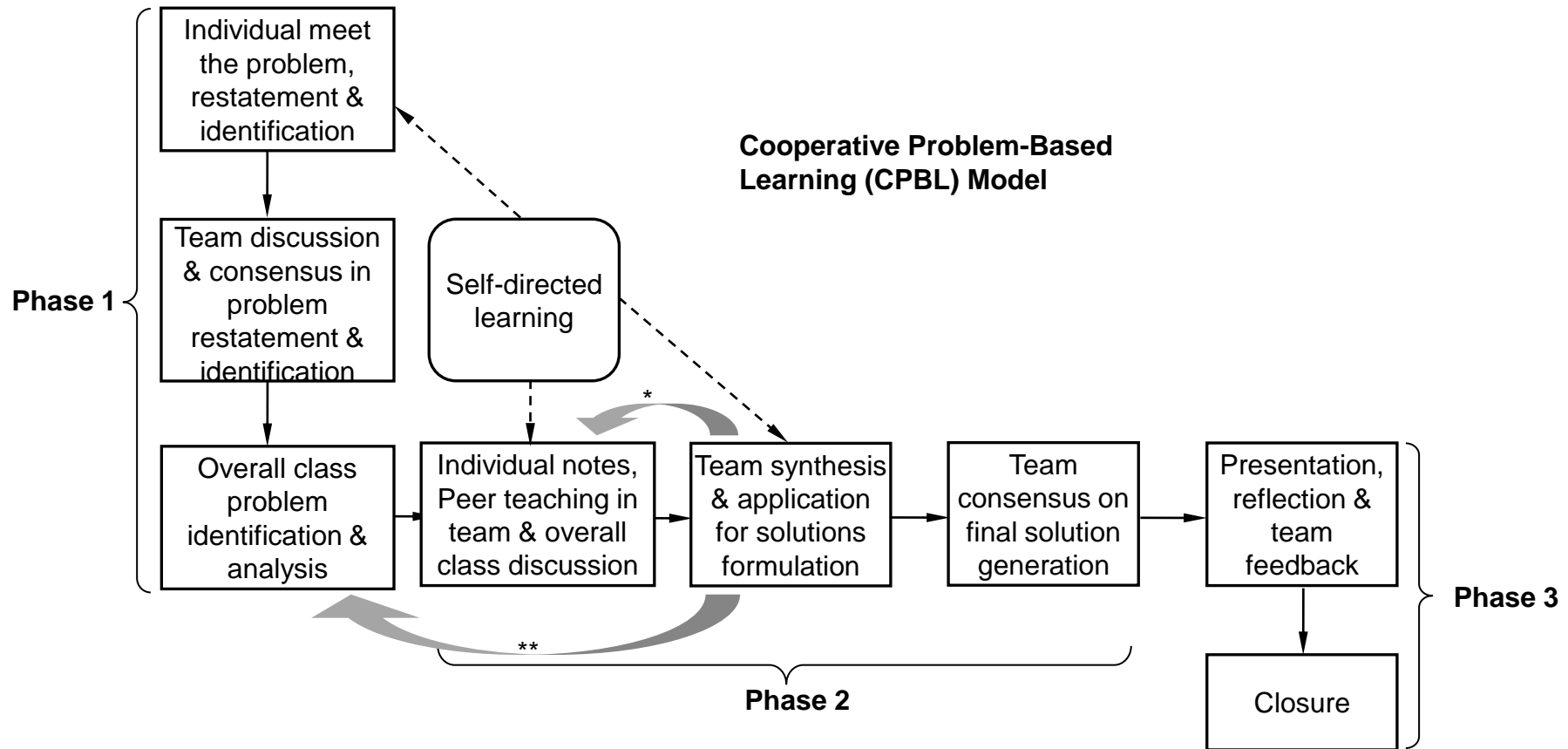
Phase 1



Phase 2

Phase 3

Cooperative Problem-based Learning (CPBL)



* Insufficient understanding of learning issues to solve problem

** Incomplete or misunderstanding of problem requirements

** Incomplete or misunderstanding of problem requirements

Forum Post from a Student:

“Going through the CPBL cycle has helped me a lot in completing the case study. With this cycle, I'm able to settle the problem step by step and at the same time reducing the stress on thinking how to settle this complicated problem myself. The discussions with team mates and during classes reduce my burden on this problem and it became easier for me to solve the problem.”

Outline

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- How? Taking the scholarly approach
- **Example: Research on CPBL – impact and practical aspects**

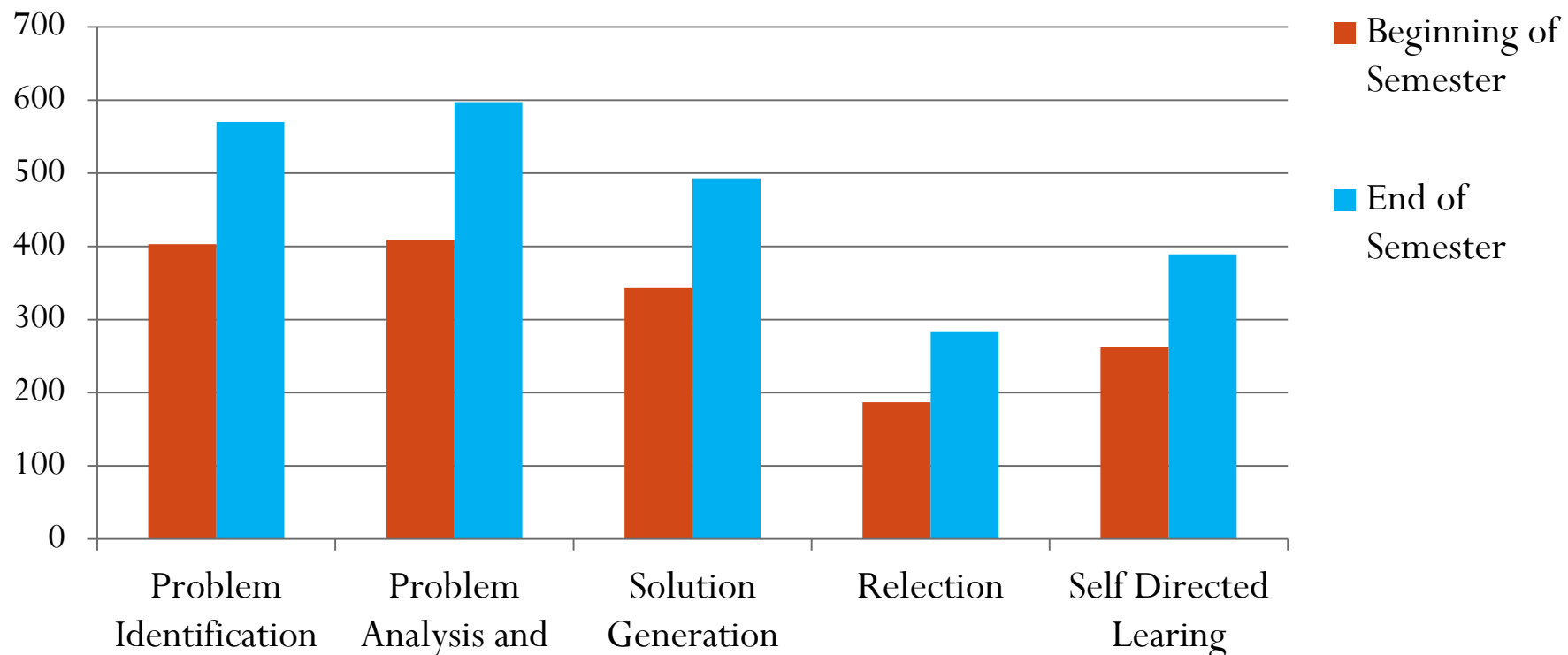
Cooperative Problem-based Learning (CPBL)

- An inductive learning method that incorporates the five principles of Cooperative Learning (CL) into the Problem-Based Learning (PBL) cycle (Khairiyah and Helmi, 2011)
- Suitable for small groups in a medium size class (40-60) with one floating facilitator

Syed Ahmad Helmi et al. (2011) found that CPBL enhances students' motivation and learning strategies, problem solving abilities, and team working skills

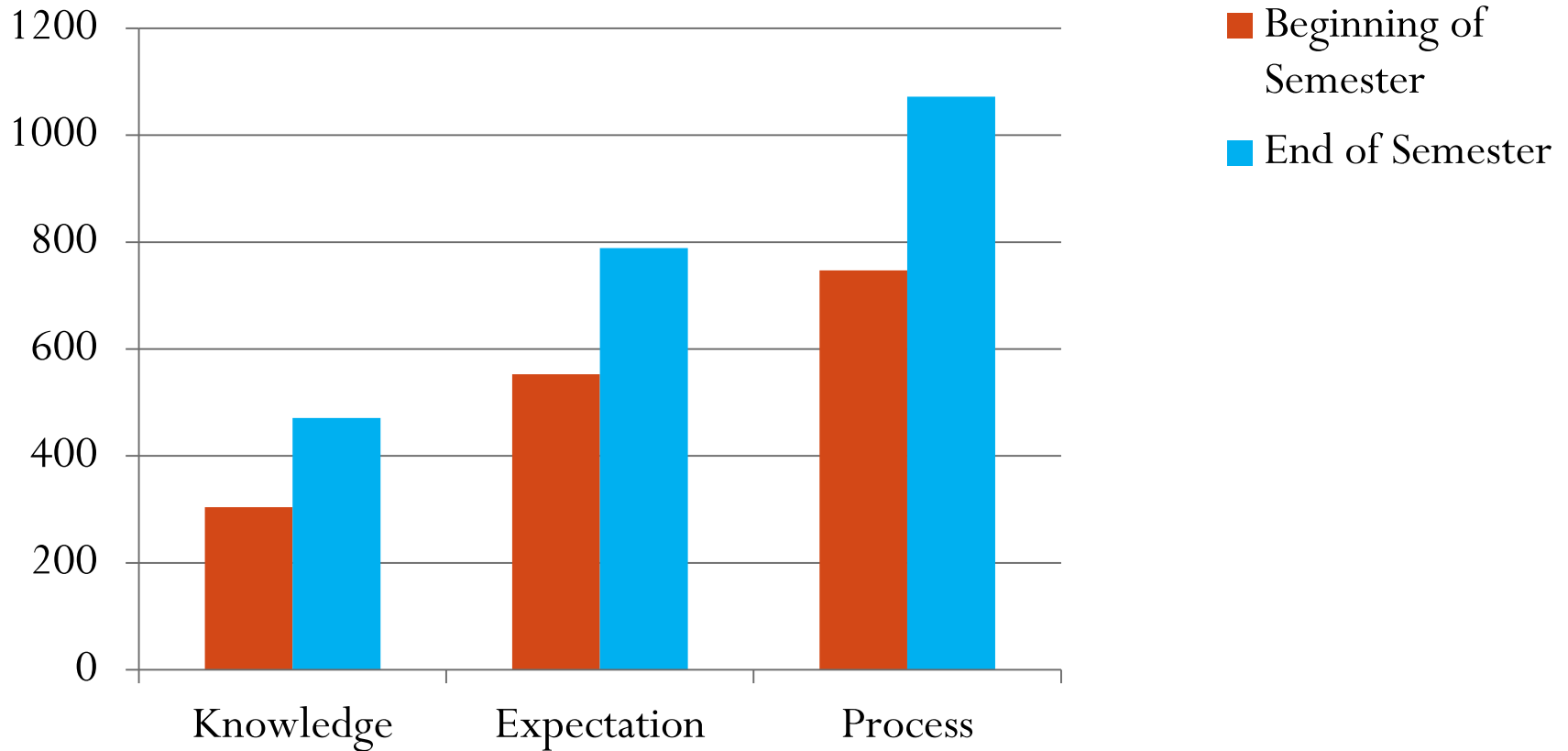
Problem Solving Ability - Deep Thinking (Syed Helmi, et al., 2011)

on
ny



	t	p< .05	Effect Size (d)
Problem Identification	8.86	Sig	1.80
Analysis and Synthesis	8.89	Sig	2.09
Solution Generation	9.68	Sig	1.84
Reflection	10.02	Sig	1.59
Self-directed Learning	7.42	Sig	1.74

Problem Solving Assets (Syed Helmi, et al., 2011)



	t	p< .05	Effect Size (d)
Knowledge	11.402	Sig	1.92
Expectation	8.615	Sig	1.76
Process	9.898	Sig	2.08

Coping with change – need to explain and rationalize => MOTIVATE!!

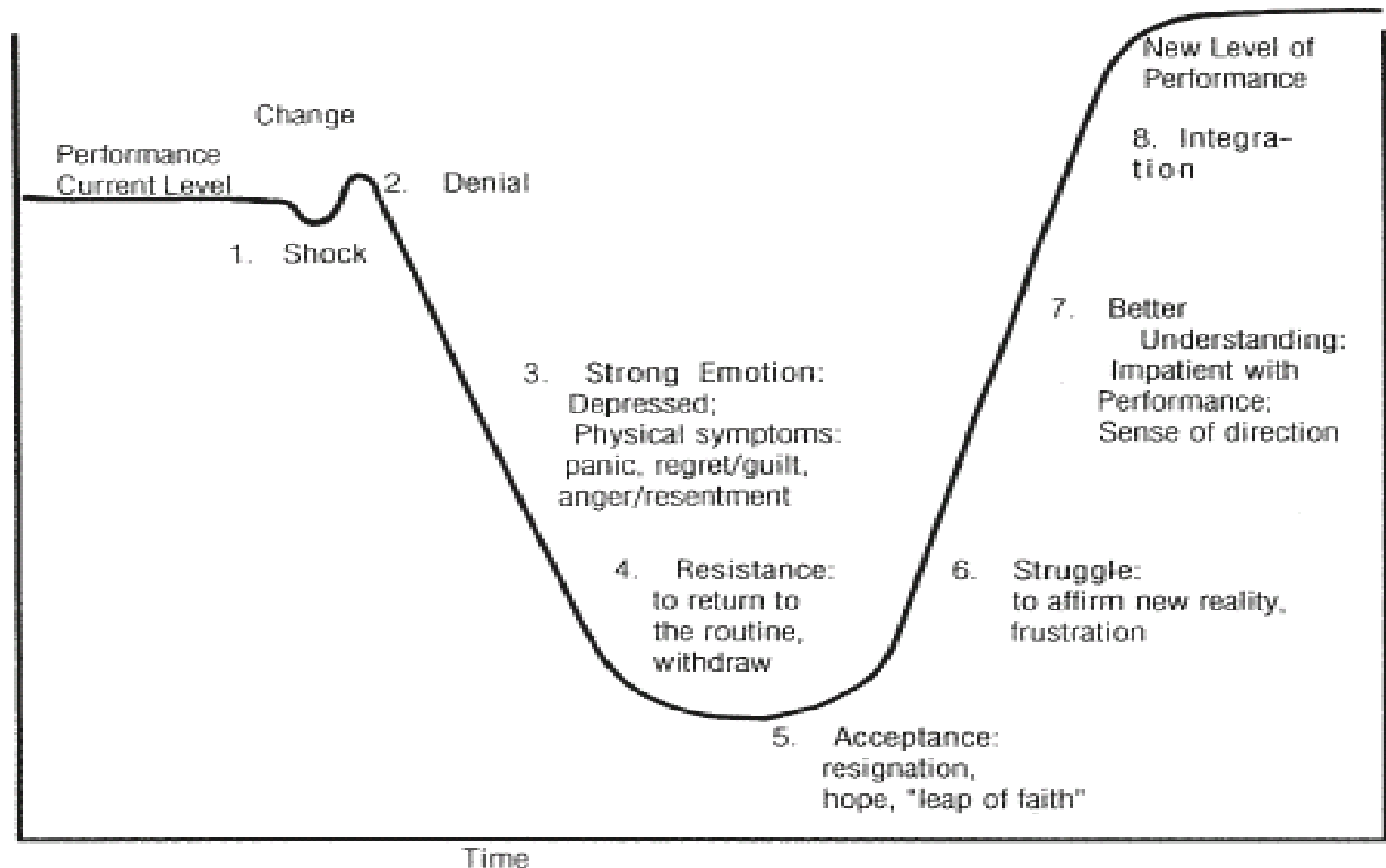


Figure 1-1 The *grieving* process as a model of how we cope with change

Students' Responses Beginning of Problem 1

- Confusion on CPBL cycle as principles and method were not well explained
- Longer time engagement on CPBL activities
- Work load anticipated by CPBL made them feel anxious and near to giving up
- CPBL requires more on self-efforts and fewer on lectures as conventional classes
- Inconvenience, unfamiliar and insecure of the new learning environment
- Low participation or involvement and individualistic attitude among group members

Students' Responses Problem 1 (cont'd)

Respondent 01:

*"I can feel difficulties for this semester. I have registered a subject that is **very tough** which is PC subject that are using CPBL method, with complicated cycle, needs full attention and commitment in order to find the solution"*

Large shift from spoon-feeding culture of learning to highly constructivist environment

Students' Responses in Mid Sem

a. Self-independent and group work engagement

Q6-A1.3. *"...I love this class! I love the self-making notes, group activities and open-minded class discussions. All these hardworking efforts make me appreciate myself more..."*

b. Improvement of reading and learning skills

Q6-A2.1. *"...the presented notes are results from reviews on peer-teaching notes from friends. I have reviewed others' models several times and study the differences and similarities in textbooks. It causes me do lots of reading, rewriting and rereading, something that I have never done before..."*

c. Optimizing own efforts in learning

Q6-A3.1. *"It very different! This learning style is not dependent on lecture and lecture notes, requires students to talk and discuss among each other. It mostly about self-learning..."*

Students' Responses in Mid Sem

d. Better understanding of own mistakes

Q6-A4.1. *"It is truly different! If we have misconceptions, these concepts will be thoroughly discussed together again and again in the classroom. It differs from previous learning method, where it's only on the paper, nobody care to ask and most students just pretend to understand..."*

e. Approach towards future industry problems and applications

Q6-A5.2. *"Since study using CPBL approach, my understandings on specific problems are better. Compared to previous classes, students only describe the theoretical situations and concepts in industry. But, through CPBL the problems are more practical, based on what may happen and how to solve the problems."*

f. Improve self-interpersonal skills and interactions

Q6-A6.1. *"Before this, I am passive, shy to interact with friends and to come forward. But now, I feel relaxed, better communications and close to my friends. Now I can even freely tell my jokes!"*

Phase 2: Factors of Changing/Maintaining

Early perception	Perception Change / Maintain	
	Develop to POSITIVE perception	Develop / Maintain NEGATIVE perception
POSITIVE	<ul style="list-style-type: none"> ○ Improve time management ○ Exposure for future application and problems ○ Clear concept definition ○ Increase soft-skills ○ Deeper knowledge & information 	<ul style="list-style-type: none"> ○ Demanding & wasting time ○ Difficult because tons of work loads ○ Very difficult to absorb ○ Too fast learning cycle ○ Feel of unfair to other courses
NEGATIVE	<ul style="list-style-type: none"> ○ Increase learning skill in learning together ○ Forced to more read ○ Clear concept definition ○ Improve time management 	

Can we use CPBL for 1st Year Students?

Developing PS Skills – 1st year students

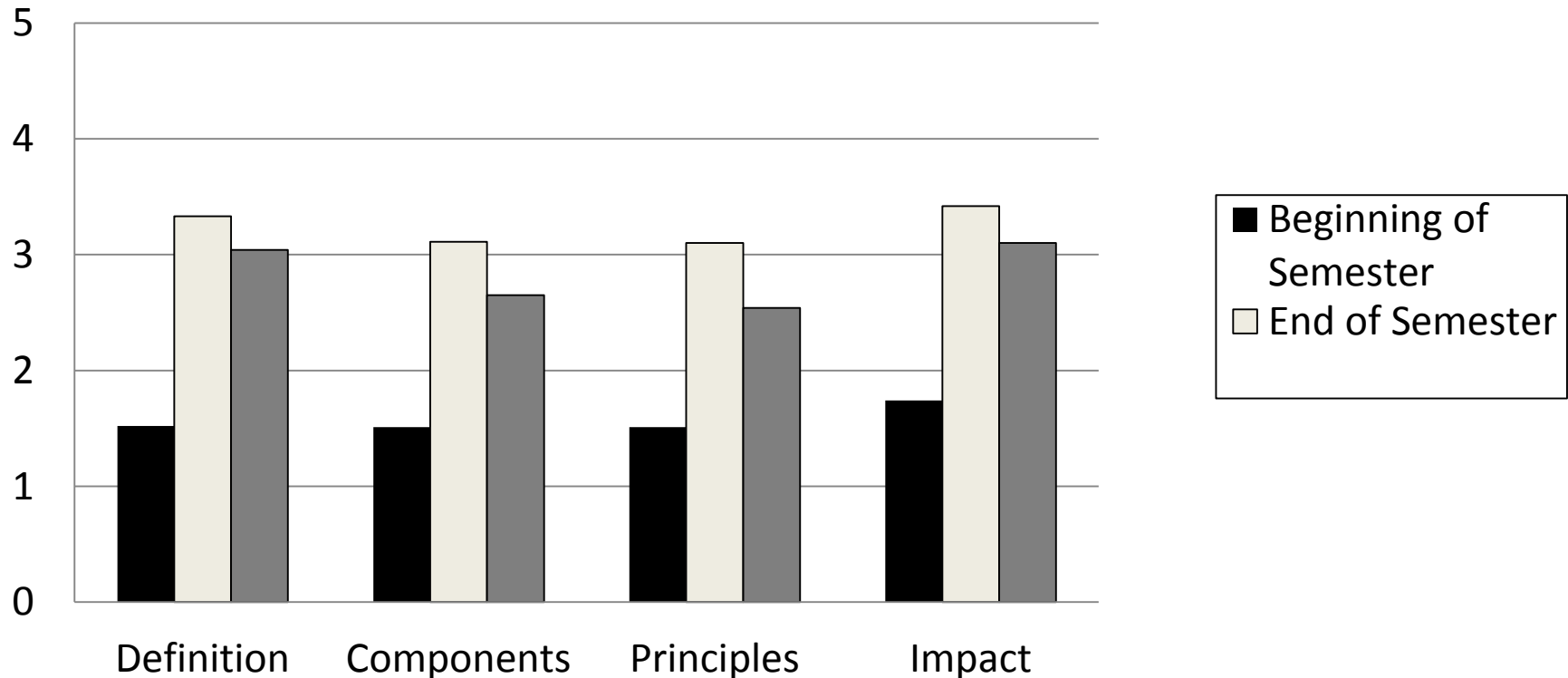
Reflective Journal 1 (S3)	It is a big pressure for me to handle as it is not a thing that I really familiar with. We have to face the first stage of this PBL that involved a lot of group discussion, completing the report and presentation.
Reflective Journal 2 (S3)	I have to do a lot of research in order to get ideas on how to conserve energy in school. This is very stressful moment for me as the number of tasks to be completed was increased.
Reflective Journal 3 (S3)	Honestly, I am very happy with the report as each of us gives full commitment to complete it. All these work are not easy as abc as each of us need to brainstorm like a half dead person to come out with a good report. However, it taught me to be patient and don't give up even though the challenges are big.

Developing Team Working Skills

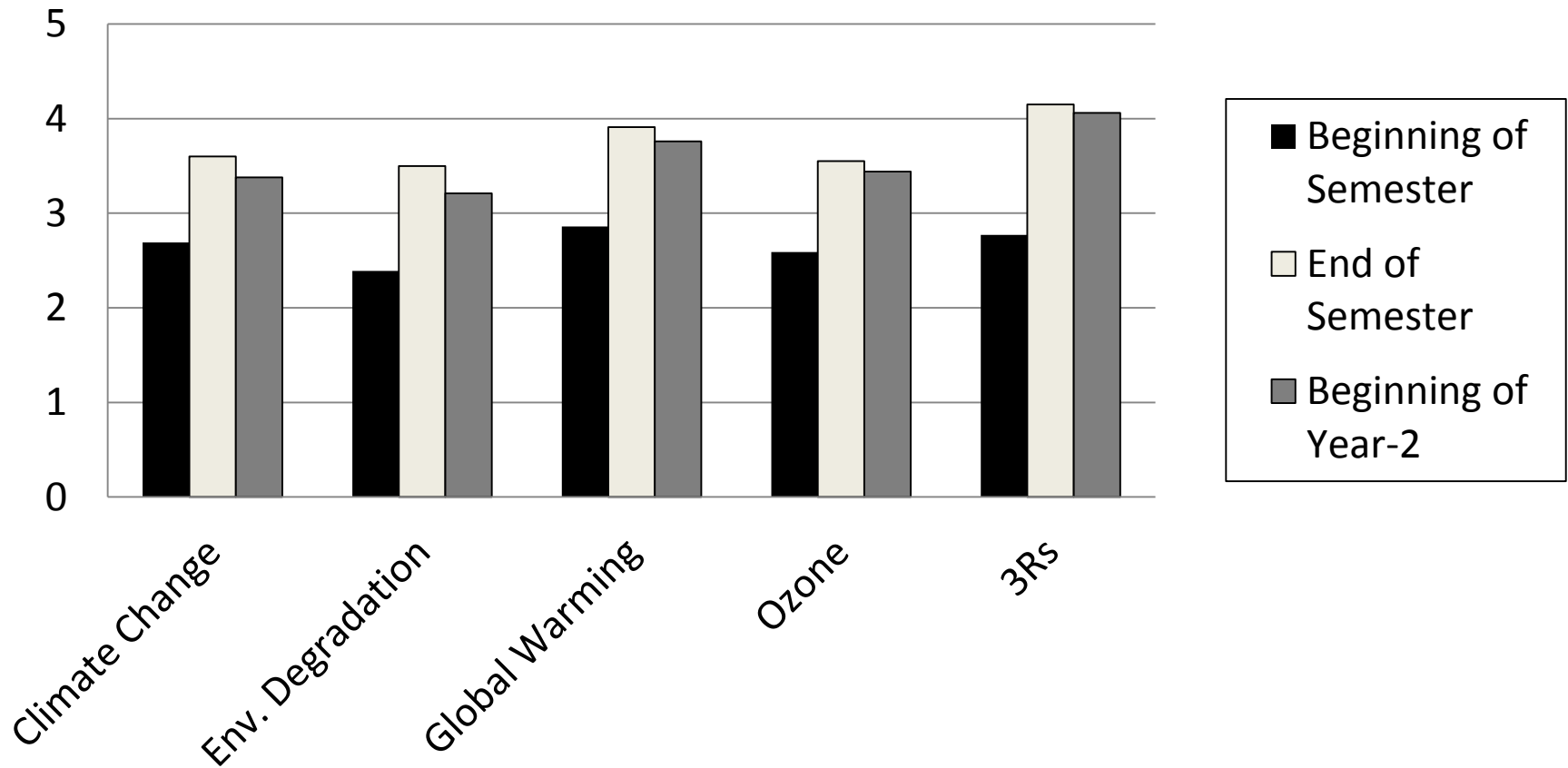
Reflective Journal 1 (S1)	It is really hard for me at first working in a team because I am not a type of person who really likes to work in a group especially in a large number.
Reflective Journal 2 (S1)	It is normal thing in team that we have problems with team members along the project is execute but then as a team we should try to communicate among members and try to overcome all the problem that we face.
Reflective Journal 3 (S1)	But thanks to my team members because this team really change a lot on my perspective when working with a team. They really help me a lot when I need them and motivate me when I needed.

Implementation on First Year Students

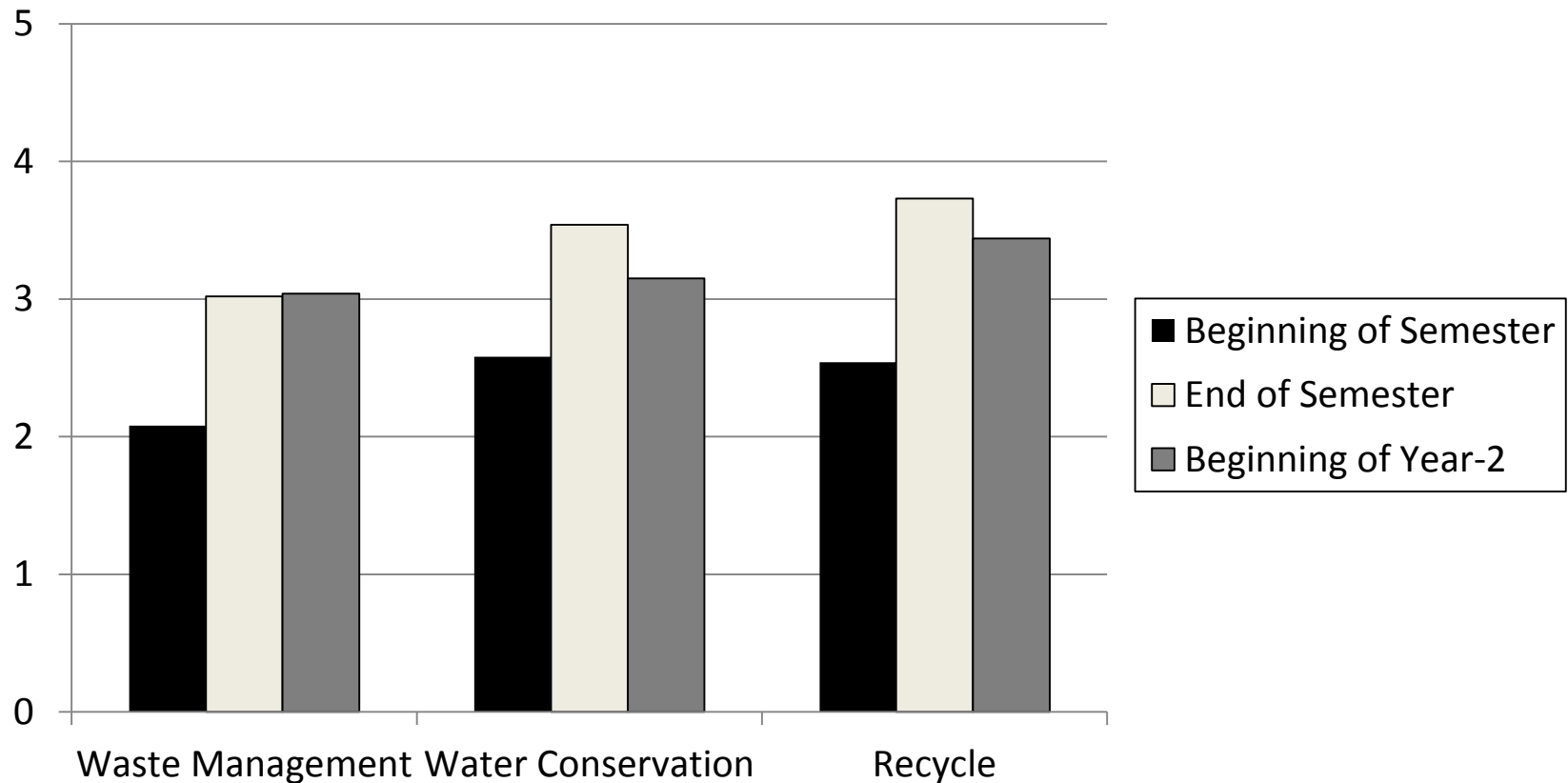
Understanding on Basic Concept of Sustainable Development



Students' Knowledge on Environmental Issues

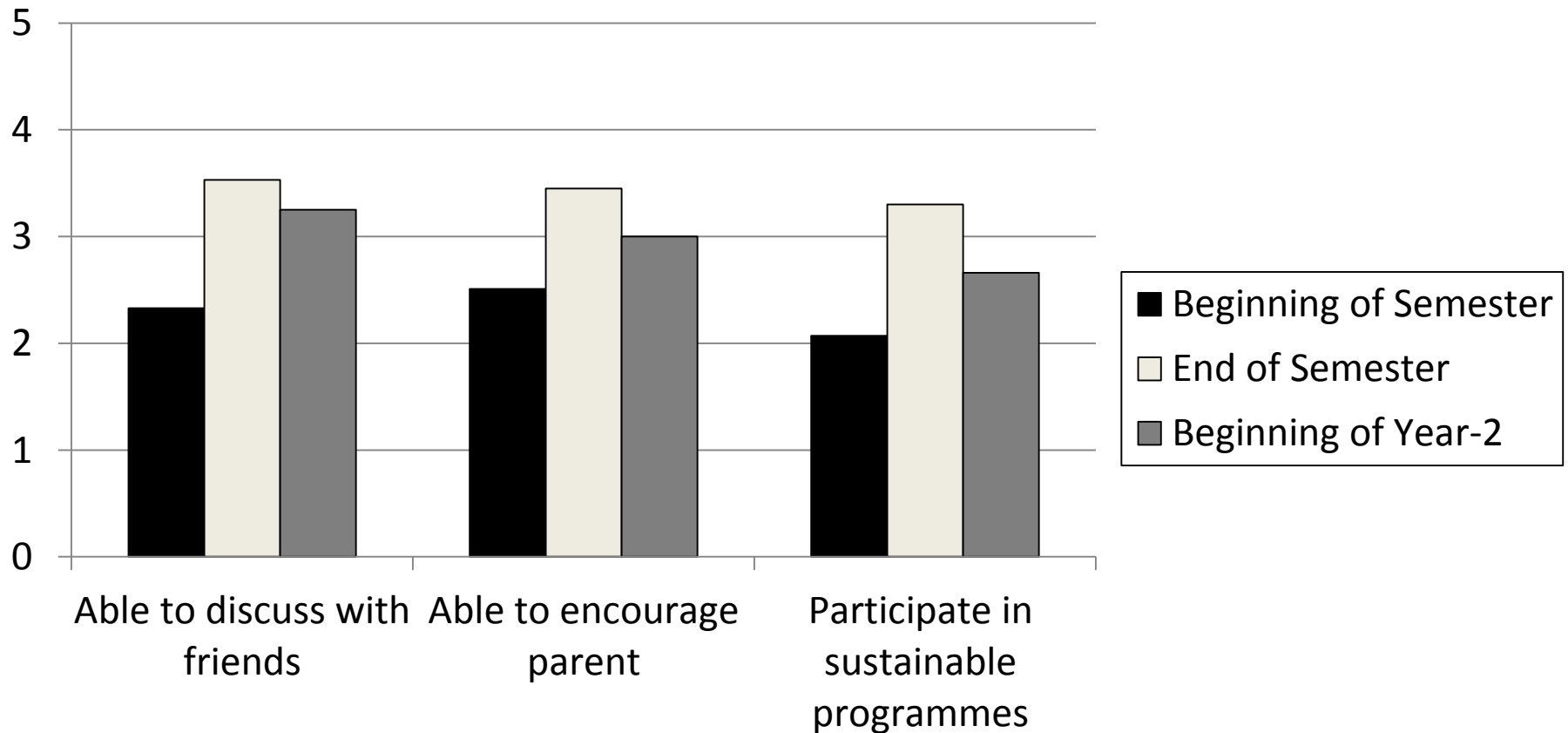


Behaviour Change towards Practicing Sustainable Development on Self Development



(Azmahani, 2013)

Behaviour Change towards Practicing Sustainable Development on Social Development





Coming up in from May 20- May 23:

Workshops on OBE by Prof. Richard Felder &
Dr. Rebecca Brent

+

Innovative Practices in Higher Education Expo 2014
(I-PHEX 2014)
<http://tree.utm.my/>

Practical Issues in attaining complex problem solving skills outcomes

- Meaningful, scholarly and evidence-based approach
- Institutionalized approach at all levels
- Proper training and mentoring
- Workload – need to be acknowledged
- Start a core group → need to have interest & passion
- Research and publish