



Alternative Assessment: Tips and Ideas for Engineering & Science Courses

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Outline

- **Alternative Assessment: definition**
- Guiding principle: constructive alignment
- Example implementations: translating principles into practice
- Online assessment tools
- Flipped Assessment
- Final tip
- Q&A

Alternative assessment is an assessment that...

- is also known as authentic assessment
- measures what students can do and cannot do
- is beyond the traditional closed book written examinations
- allows students to receive feedback for improvement (most of the time)
- can easily be aligned to outcomes
- may require more time and effort

Possible forms of alternative assessments?

www.menti.com CODE: 30 10 20

Possible forms of alternative assessments

- Portfolio
- Various forms of reports
- Reflection
- Students develop exam questions with full answer
- Progress report
- Proposal
- Open book tests or quizzes
- Take home written exams
- Building or developing a model
- Making summaries or essays

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- Alternative Assessment: definition and scoping
- **Guiding principle: constructive alignment**
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Guiding principle: Constructive Alignment (John Biggs, 1999)

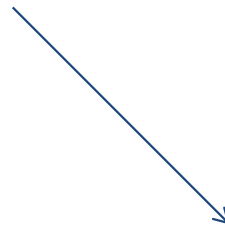
Intended outcomes must clearly
be indicated

Teaching and learning
activities match outcomes

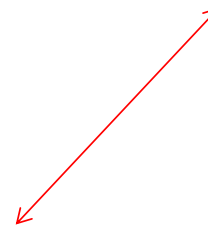
Lecturer's
Intention



Student's
Activity



Assessment
Tasks



Assessment drives learning

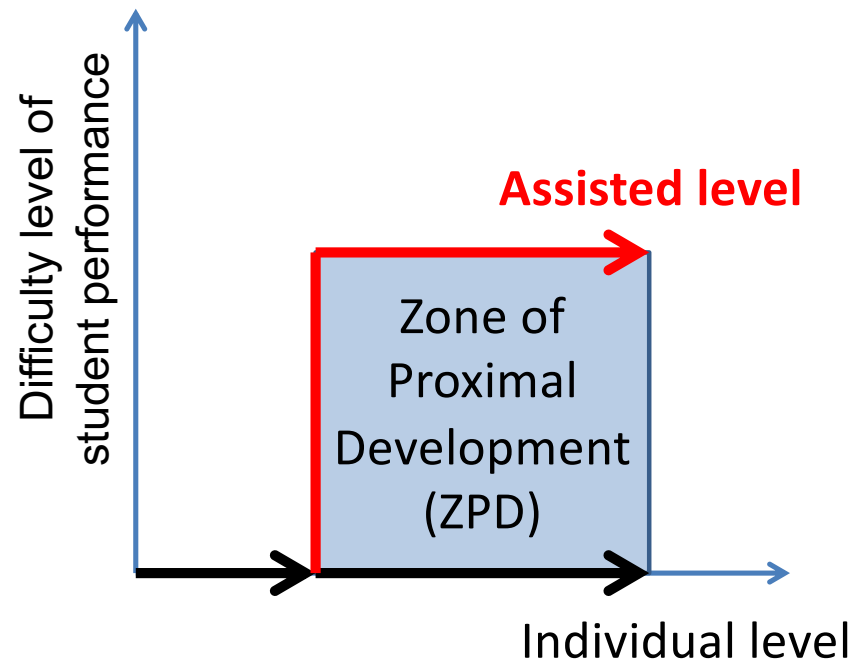
Students learn according to
how we assess them

Assess intended outcomes



Can you get to
the red door?

Scaffolding to support student learning



ZPD = Distance between individual performance and performance with social support (Vygotsky)

Scaffolding to reach the ILO

Intended Learning Outcomes (ILO)

**Teaching and
Learning
Activities**



Assessment Tasks

Guideline for constructing the assessment

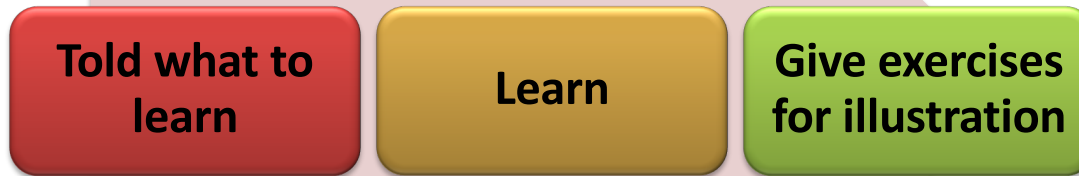
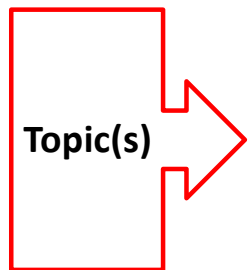
- Define the outcome
- Create activities that will bring up the active verb in the outcome
- Decide on the guidance needed, or any form of scaffolding required
- Try it out, and make revisions

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- Guiding principle: constructive alignment and How People Learn (HPL) Framework
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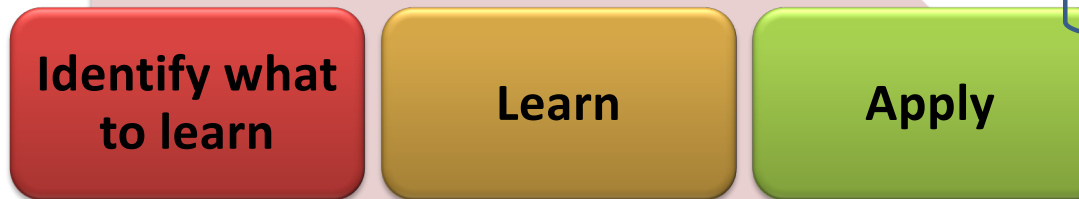
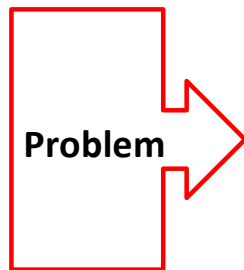
Example 1: Assessment in Problem Based Learning (Can also be used in Projects)

Commonly used Teaching and Learning (T&L) Model



**Deductive
T&L**

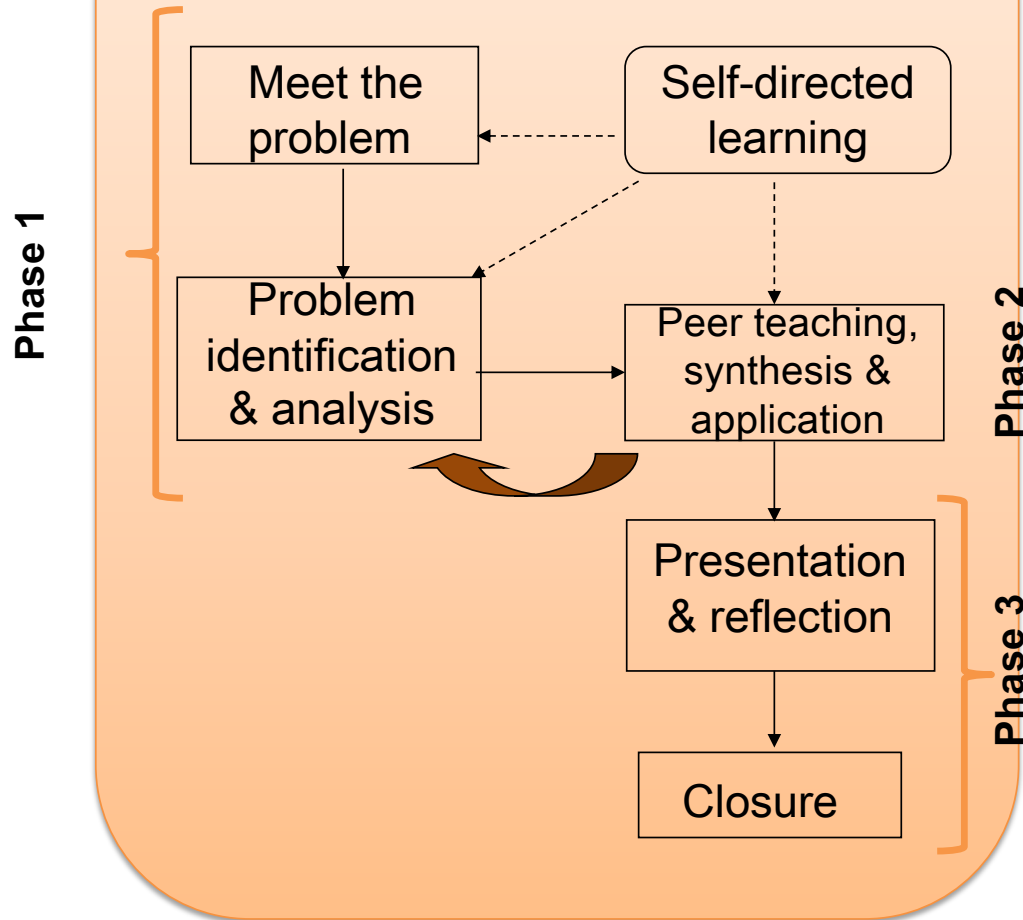
PBL: Is it possible to turn it the other way around?



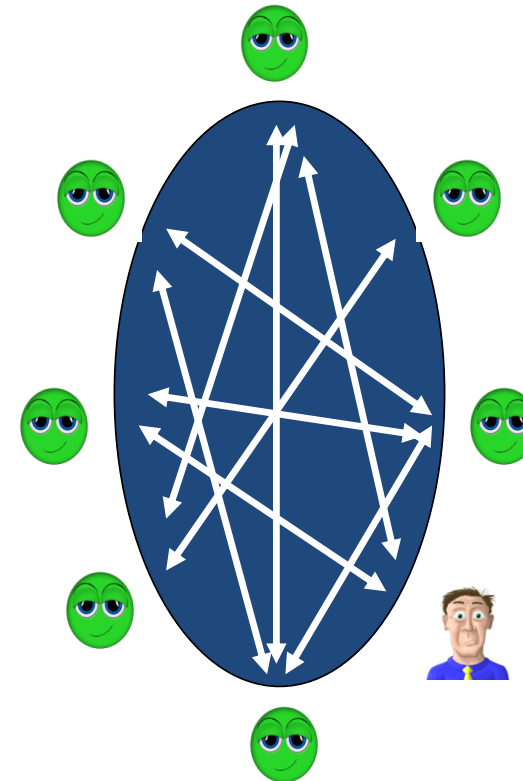
Powerful for engaging learning
& developing self directed
learning

**Inductive
T&L**

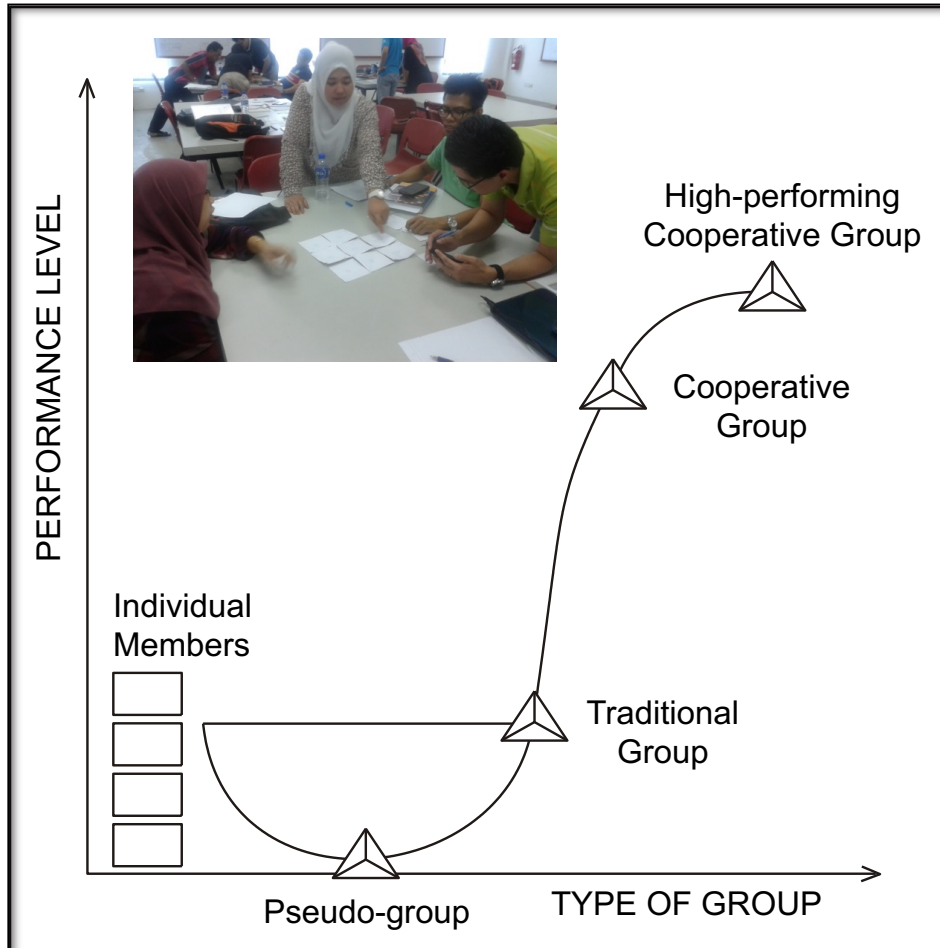
The PBL Process



Typical PBL Medical School Model



Cooperative Learning Implementation: Performance Level of a Group (from K. Smith, 2007)



Cooperative Learning Principles

Positive interdependence

Individual accountability

Face to face interaction

Appropriate interpersonal skills

Regular group function assessment

Informal Cooperative Learning Pattern

Involves everyone!

Individual construction



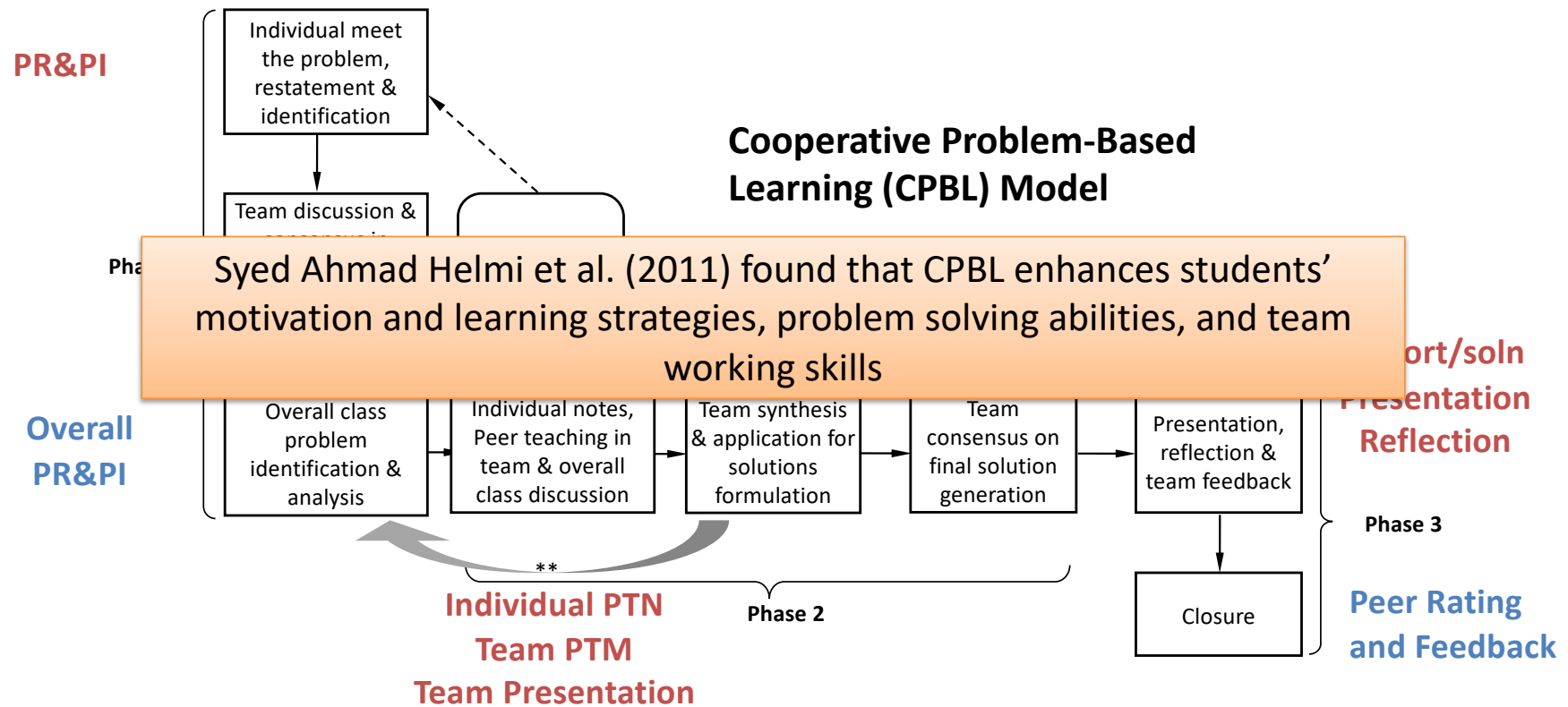
Construction and interaction with neighbor/team member



Overall class interaction with instructor



Cooperative Problem-based Learning (CPBL)



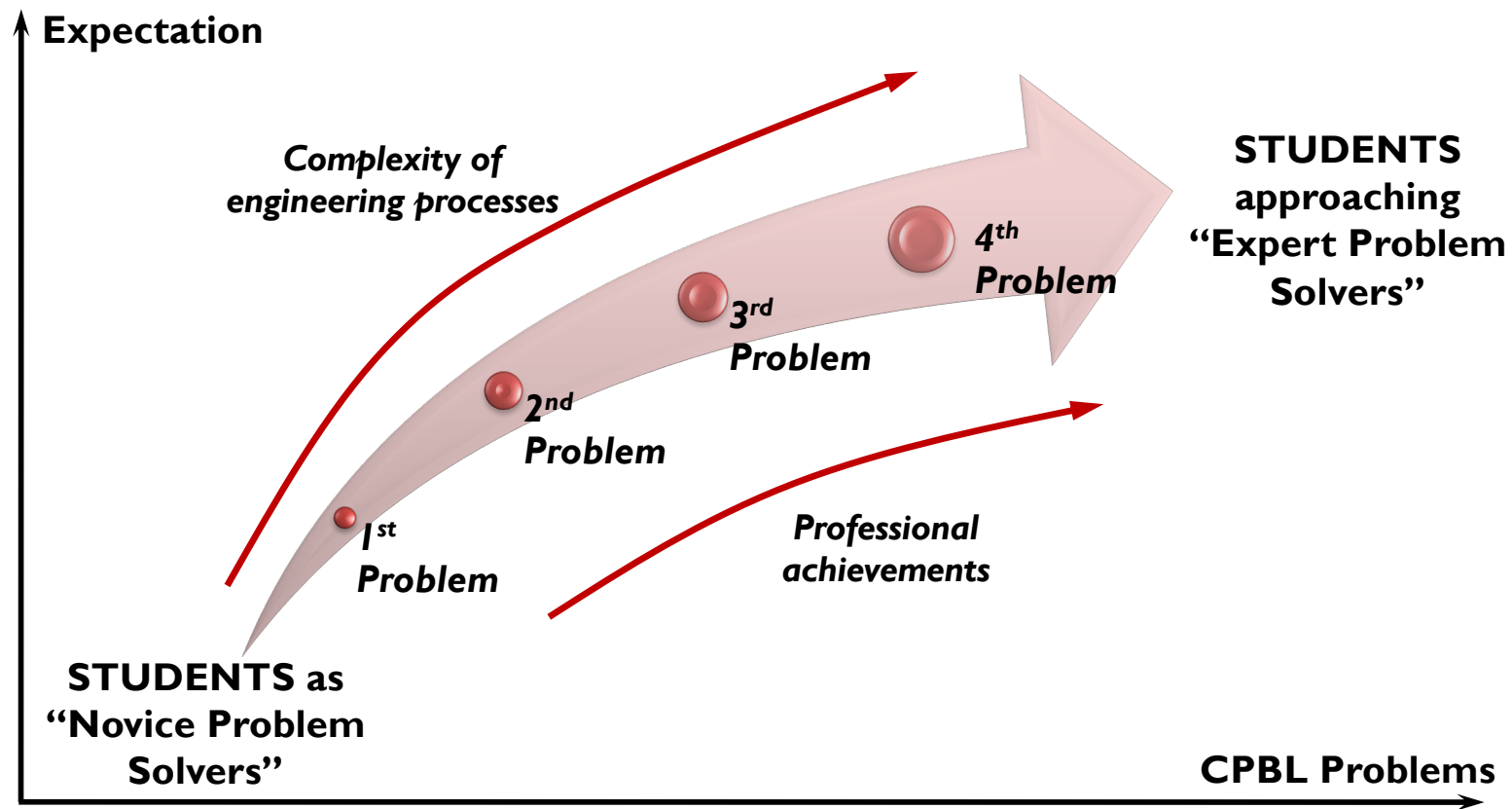
* Insufficient understanding of learning issues to solve problem

** Incomplete or misunderstanding of problem requirements

Mohd-Yusof, et al 2011

Series of Problems

Scaffolding in organization of problems for a whole semester in a course



The Scenario

The Scenario

The Scenario

The Scenario

The Scenario

The Scenario

Your team

reactor. On

and this is

afternoon, y



FINAL CASE STUDY


Design of Automatic Control System for CCM Chemicals (M) Sdn Bhd

The Scenario

Now that you have experience as a process engineer, you have decided to join a process control consultancy firm, PARAGON Consulting Sdn. Bhd.. You are hired because of your knowledge in chemical engineering, experience as a process engineer, and credentials. Since many of the firm's engineers are electrical and mechanical engineers, your job scope includes: i) provide expertise to other engineers to understand, describe and analyze chemical processes, and ii) design automatic control systems for chemical processes. One Tuesday morning, you received the following email from the general manager:

Reply Reply all Forward Delete Print Back Next

To: Design Team <design.team@paragon.my>
From: Abu Bakar Iman (abi@paragon.my)
Date: 29/03/2011 11:00AM
Subject: Design of automatic control system for CCM Chemicals



PARAGON
skills for industry

Good day engineers,

I had a meeting with CCM Chemicals' plant manager last week. They are now having problems with the existing control systems of their chlorine gas absorption processes. To be specific, they are facing difficulty to maintain the process variables at the desired operating conditions. Plus, they are experiencing inconsistencies in the online measurement of the product specs too. There are two chlorine gas absorption columns operating, as part of Chloralkali Process for chlorine production, in the company. At the moment, CCM Chemicals is urgently looking for a prospective consultancy firm to solve these problems. Due to our excellent track record in the previous consultancy projects, they've invited us to bid for this project. Therefore, I want your team to design/modify the

Example 2: A Zine Assignment Application, Analysis and Synthesis

Virtual Targeted

The questions: What we want to know describing HCDE related research? In individual CHI and CSCW best papers reflected in HCDE related research?

* This concept of a virtual notebook is metaphor of a notebook as the means

Approach

Questions

The investigation questions: What we want to papers describing HCDE related research? In CHI and CSCW best papers? More HCDE related research?

The learning questions: What do we need to be ethics? How do we each understand ethics? What engaging in HCDE-related work? What might it look like over time? What might we need to understand ethics?

Part 1, First pass (Due Tuesday, 11/11/2017)

1. Do this. Think about your curated papers in terms of (a) the ethical issues explicitly, and (b) the extent to which your thoughts, read the Belmont report, a his/hers human subjects. You might also look at Brewster's position papers from the 2015/2016/2017 your own perspectives on ethics Finally, choose your own perspectives on ethics
2. Prepare this. Prepare a single sided handout on considerations and potential latent ethical considerations and potential latent ethical considerations one or more questions that you think would be interesting to discuss. Submit your "handout" by adding
3. Submit this. Submit your "handout" by adding

Part 1, First Pass discussion

- Across CHI/CSCW papers, how do the papers address ethical issues?
- Across CHI/CSCW papers, what types of ethical issues are addressed?

Approach

Part 2, Second pass (Due Thursday, 13/11/2017)

- (1) Do this. Imagine having a compilation associated with recently published HCI papers to create one contribution to that zine the ethical considerations associated done in order to produce the paper. A zine is a small, handmade publication. Encounters in HCI position papers to Of the potential issues you could discuss likely to complement what others in the field are doing.
- (2) Prepare this. Claim a page (or two) in the paper you have chosen. In addition to the paper, identify a graphic of your paper. If you connect to specific citations as well. In other words, craft your paper. Submit your work by adding
- (3) Submit this. Submit your work by adding

Part 2, Second Pass discussion

- What is our goal? (10 min)
- What goes with what? Self-organizing systems
- What are connecting threads? Affinity diagrams
- What's interesting? (30 min)

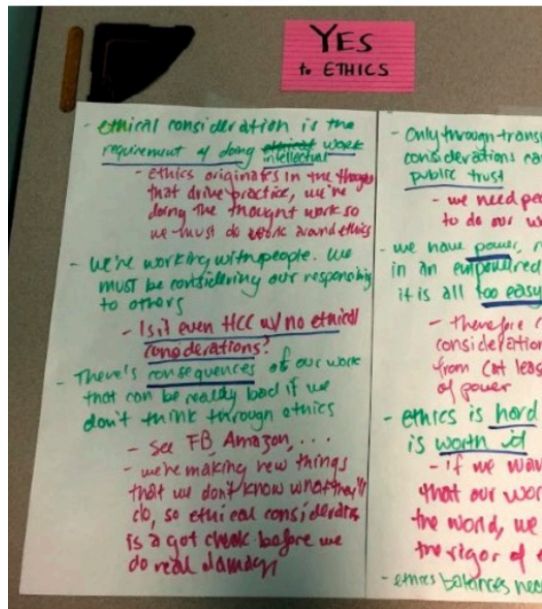
	Paper 1: Add the citation	Paper 2: Add the citation
Question 1: To what extent and in what ways are ethical issues addressed explicitly in each paper?	(1.1. fill this in)	(2.1. fill this in)
Question 2: Looking beyond the ethical issues explicitly addressed in the paper, what additional ethical issues seem latent in the work? To answer this, you might do a close read of the method section, think about what all would have been entailed in the work overall, how it connects to the Belmont report, etc....	(1.2. fill this in)	(2.2. fill this in)

Template

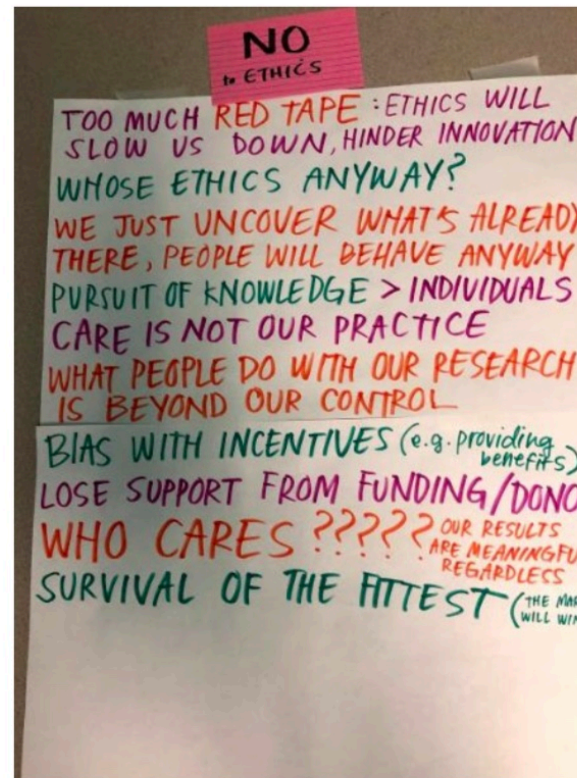
3. Questions raised by this analysis:

Your Name

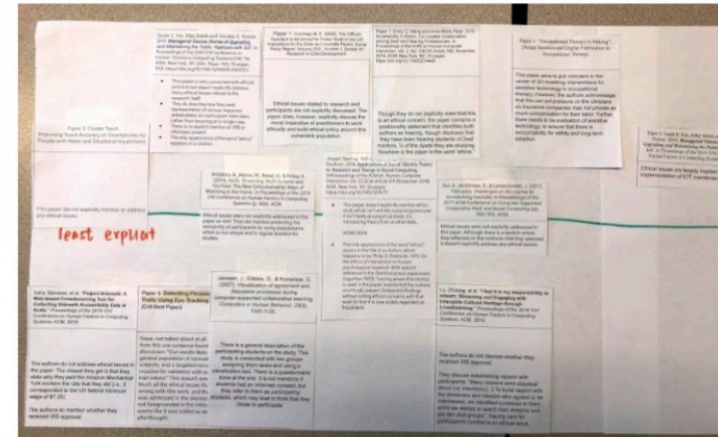
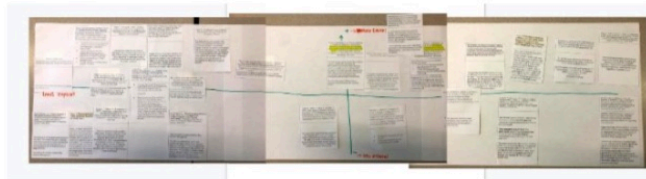
Should we talk about ethics



Should we talk about ethics?



Explicitly addressed?





InstrumentZine Assignment

Possible Zine Assignments?
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Online Assessment Tools



Why formative assessment is important?



Can you name some of the online tools suitable for formative assessment?



What is the best way to use these tools?



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Low Bandwidth Online Formative Assessment Tools



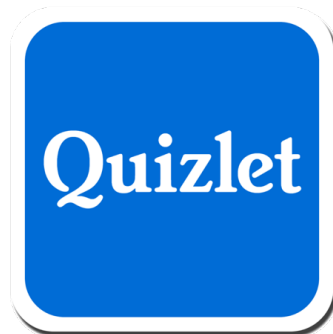
Mentimeter



socrative



QUIZZZ



Quizlet



edpuzzle



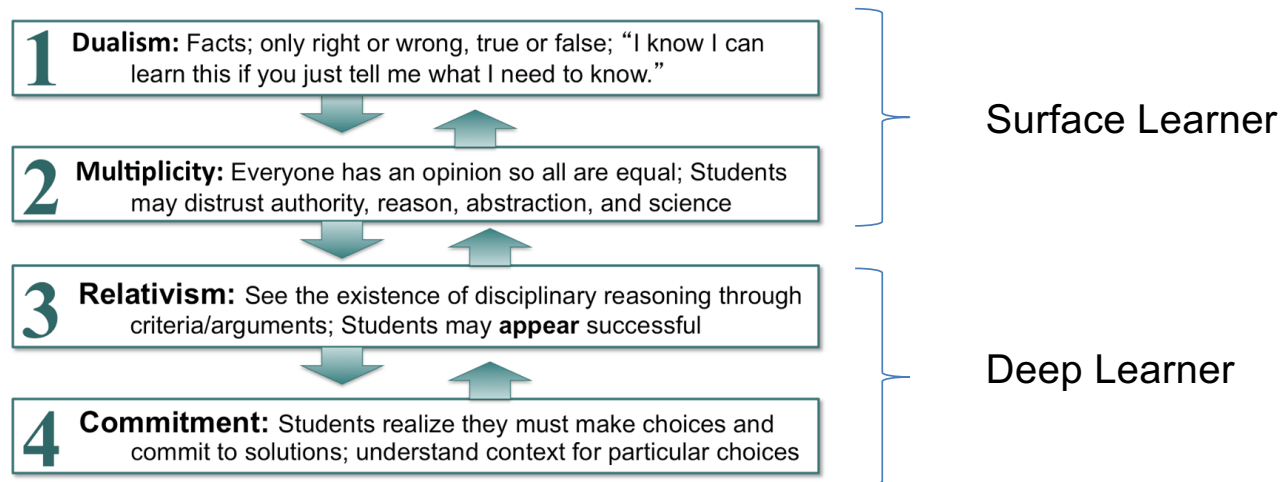
Poll Everywhere

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Characteristic of Surface Learners

Intellectual Development Stages



Nelson, Perry, Belenkey

Exam oriented

A lot of memorisation

How I can easily remember this?

I think the lecturer didn't teach this at all

Will this be in the exam?

Flipped Assessment

What do you think it means by flipped assessment?

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- Students think like the lecturer
- Students developed exam questions with complete solution

Methodology



ROLE OF STUDENTS & LEARNING OUTCOME ADDRESSED

Students are given role as faculty members to setup final exam questions for a specific learning outcome



REQUIREMENTS OF THE ASSIGNMENT

It must be an original question and solution

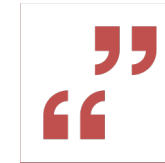
70-80% of the question must be on higher taxonomy (based on Bloom Taxonomy Level 4-6). You have to choose the right guide word based on the attachment given.

Students may include analogy to the daily application or any industry related process

Students must prepare a complete solution, which includes the derivation and step by step solution to the final answer.

It must be tailored to closed book format, free from grammatical and English related error, formatted well (alignment, space) with the allocated mark should be up to 25 marks

Students are advised not to prepare too many guided sub-questions as guided question may bring the level of taxonomy towards low order thinking skills taxonomy.



SUBMISSION AND GRADING

Student to submit their assignment via Turnitin and the grade is given via Turnitin.

Rubric is developed in Turnitin, which encompasses 4 main parameters:

- High Order Thinking Skills (HOTS) - 30%
- Originality - 20%
- Solution - 40%
- Format/Language - 10%

Example of Instruction

ASSIGNMENT

You are the newly appointed chemical engineering lecturer in one of the private colleges and being tasked to teach reaction engineering course for the 2nd year degree students. Towards the end of the semester, you have been tasked by the dean of your faculty to prepare an exam question that is related to the non-isothermal steady state reactor design for your students.

The dean would like to see an improvement from the past exam questions, he feels that it would be very easy to the students if you only address on 1st order reversible reaction. Therefore, he wanted to see the question to involve 2nd order reversible reaction with respect to each reactant. He wanted you to avoid isomerization reaction at all cost as part of the question. The question must be able to address reactor sizing in the case of non-isothermal steady state reaction, which therefore should include all the relevant parameters to size it.

Further requirements to prepare this exam question are:

- i) It must be an original question and solution
- ii) 70-80% of the question must be on higher taxonomy (based on Bloom Taxonomy Level 4-6). You have to choose the right guide word based on the attachment given.
- iii) You may include analogy to the daily application or any industry related process instead of typical $A+B \rightarrow C + D$
- iv) You must prepare a complete solution, which includes the derivation and step by step solution to the final answer.
- v) It must be tailored to closed book format, free from grammatical and English related error, formatted well (alignment, space) with the allocated mark should be up to 25 marks
- vi) You are advised not to prepare too many guided sub-questions as guided question may bring the level of taxonomy towards low order thinking skills taxonomy.

There'll be a faculty examination meeting on Saturday 20 August 2016. Therefore, you are given one week to prepare this exam question starting from 12 August 2016 until 19 August 2016 11.59pm. The faculty meeting will not consider any late submission, which in this case will affect your salary and annual performance. This has to be submitted through Turnitin (www.turnitin.com) to check the similarity and originality, by using the following details

Class ID **12908162**
Enrollment password **REMAY2016**

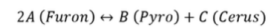
During the faculty examination meeting, they will rate each submitted exam question based on this rubric. In order for you to get the right assessment, please follow strictly the rubric, which is given in the appendix section.

ALL THE BEST!





Question 1

A group of individuals from GuitarHeads Ltd are trying to produce new anti-rust guitar strings. Sinister Gates was hired to make a reactor to produce the coating layer for the strings. He decided to use Furon (A) which decomposes into the coating layer, Pyro (B) and Cerus (C). The flowrate of Furon (A) is 124 mol/s. The reaction is a gas phase reaction that is carried out adiabatically, and the product will then be liquefied into the final coating layer. The reaction is as follows:



Provided information:

$E_A = 75000 \text{ J/mol}$ Heat Capacities at 25°C:
 $k = 29.4 \text{ m}^3/\text{mol.s @}321\text{K}$ $C_{p,A} = C_{p,B} = C_{p,C} = 105 \text{ J/mol.K}$
 $\Delta H_{RX}^\circ = -9950 \text{ J/mol}$
 $K_c = 4.4 \text{ @}380\text{K}$
 $C_{A0} = 3.1 \text{ mol/m}^3$

- What are the assumptions you need in order to proceed? Can you elaborate on the reason why the energy balance is important in this reaction?  [3m]
- Assuming an equilibrium conversion of 80%, in order to achieve a final conversion of 75%, what reactor arrangement would you recommend that is economical to achieve this conversion. [17m]
- Based on what you know, how would you propose to increase the conversion with the given equilibrium conversion?  [5m]

Take Home Test

Ahmad Zuhair Zaidan | Take Home Test (Ahmad Zuhair Zaidan 20851)

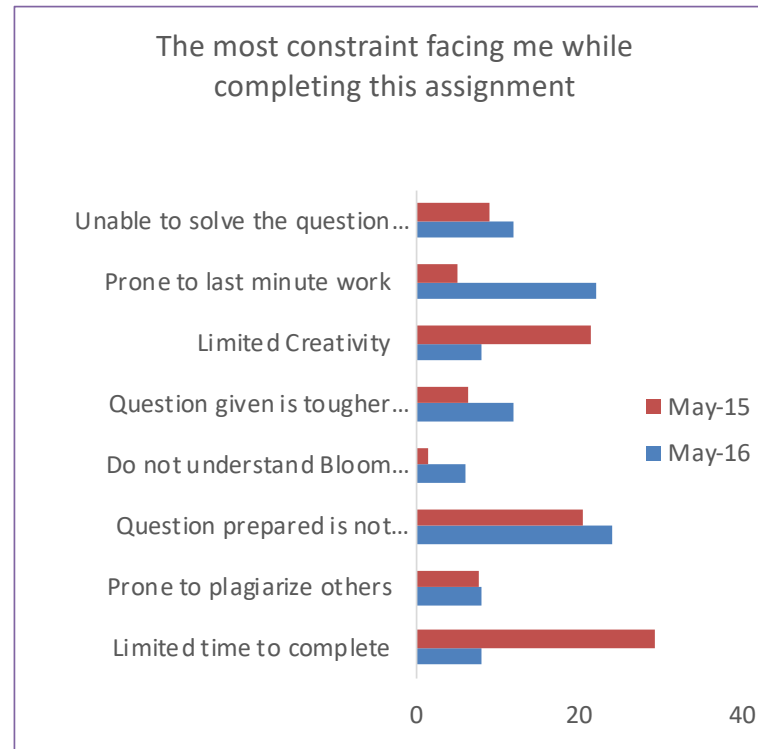
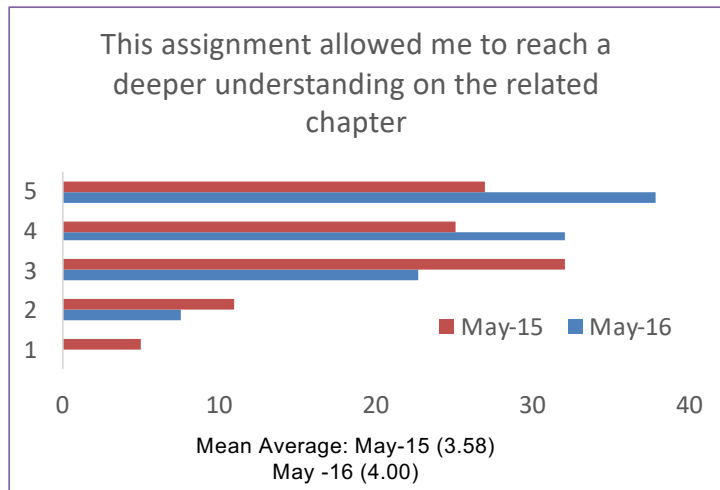
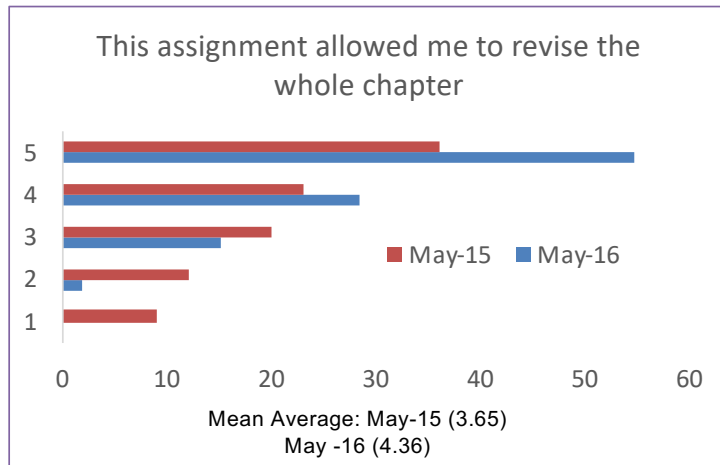
Criteria	Scales	Scales				
		Outstanding 5.00	GOOD 4.00	Satisfactory 3.00	Below Satisfactory 2.00	
HOTS 	30 %	>70% of the questions are of HOTS level	>60% of the questions are of HOTS level	>40% of the questions are of HOTS level	More than 30% of the questions are HOTS level	Less than 30% of the questions are HOTS level
Originality	20 %	The questions and solutions are > 90% original with Turnitin similarity index report <10%	The questions and solutions are > 70% original with Turnitin report <13%	The questions and solutions are 50% original with Turnitin report <20%	The questions and solutions are 40% original with Turnitin report <30%	The questions and solutions are 30% original with Turnitin report <40%
Solution	40 %	The solutions are 100% correct and complete	The solutions are 90% correct and complete	The solutions are 70% correct and complete	The solutions are 50% correct and complete	The solutions are 40% correct and complete
Eng/Format	10 %	Appropriate format and minimum grammatical error	Appropriate format and acceptable grammatical error	Appropriate format and intolerable grammatical error	Not formatted with poor English command.	Does not follow the format

Total Score: 4.7/5

Apply to Grade

Close

Students' Feedback



Students' Reflection



It is an **interesting method of learning** as for me, i believe that we as students have to give our full commitment to complete the task given by the lecturers no matter how challenging it is.



I think it is good for students to be practice as they need to fully understand the topic to create question about it. Thus, **by hook or by crook they need to understand the topic very well.**



At first, sure student will complain, its hard and all that. But in the end of the day, the knowledge matters. This kind of test will be an advantage for the students who keep working hard and keep doing some research. Its fun in the end of the day. And it will be satisfying if you really put some effort.



Actually, take home test is not bad at all as it teach us to think creatively and understand how our lecturers struggle much to create questions for us. After all, thank you for everything and pardon my english :')



I love the idea of take home test, but i am not that creative. Every time i think of smthg, when i tried to search it, i found out someone else had done the question. (google it to make sure i am not doing any plagiarism in my head 😊) and, doing active learning with take home test sure is a difficult thing to be learnt in a short time. Sometimes, I can understand the chapter by reading, watching video and do some research, but for chapter 8 RE for example, it was hard to understand it and then we need to do the take home test about the chapter. Sure, lecturer always said, met us if u have any difficulties. But my difficulties is i don't know what i didn't understand. But at the end, i did survived this subject. No matter how difficult the task given, it is all a matter of yourself right. Either you want to push it until your limit. Or u want to always be in your comfort zone.

Students' Reflection (cont')



i like the idea of flipping the classroom. but maybe because it was the first time , so it took some time for me to adapt with the new way of learning. thanks!



I am a person who at first i cant understand about the chapter. And then, when it comes to creating questions and solutions, it become too hard for me.. thats all

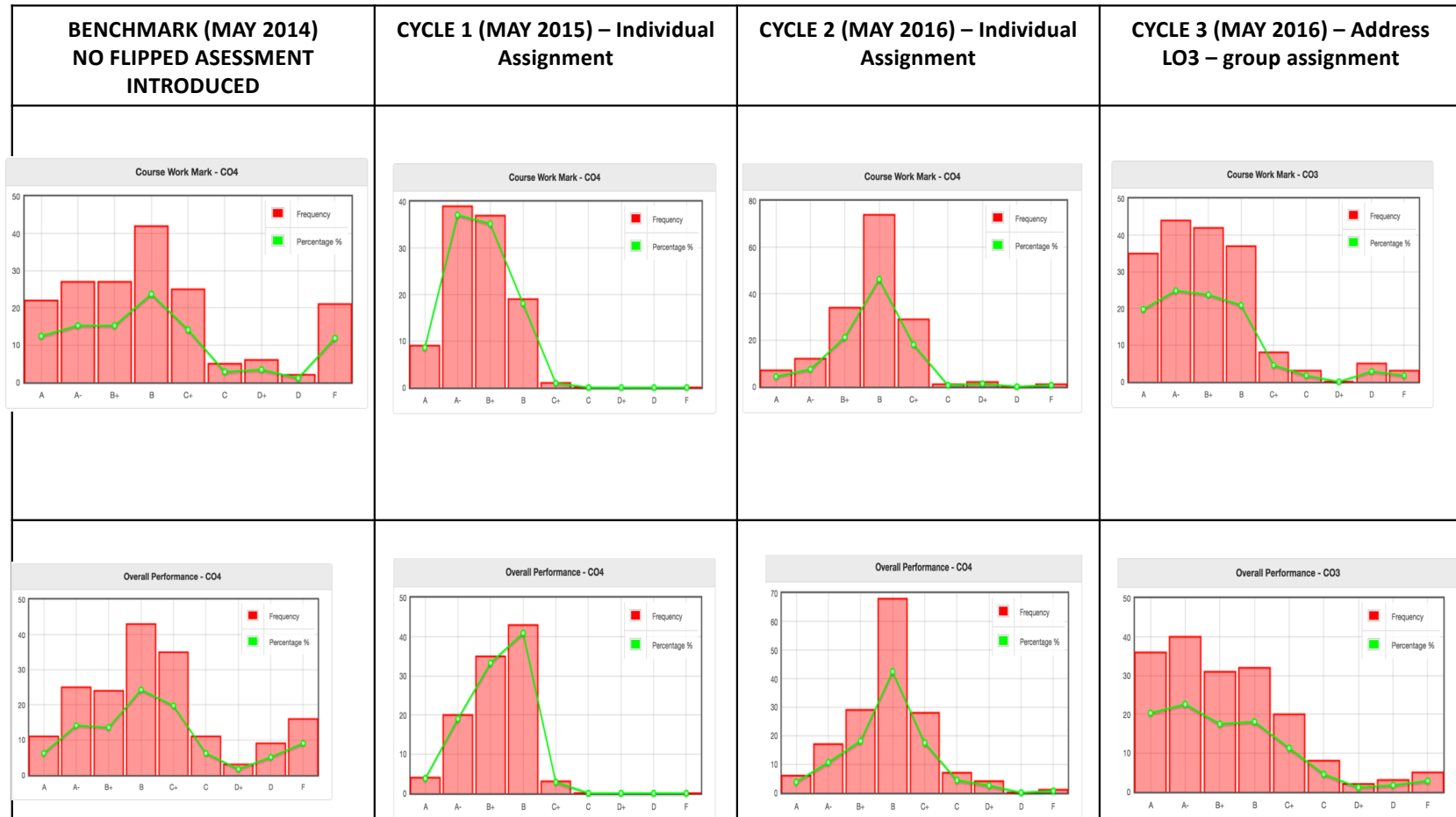


It was absolutely the best way to test your student. It really helping me in understanding the topic. Before making the question one have to really understand the topic before one questioned others. But one thing that I hope is follow up. Because after the student already did the question it just that. For me I really want to know what my marks and what I did wrong. But I never do that and it was my fault. Anyway thank u for this kind of opportunity..it was really fun.



Last semester my result is improving than the other semester.. So, I feel I will try my hard and my best for the other next semester to keep improving my understanding and ability to create critical thinking in this course

Students' Performance



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- Alternative Assessment: definition and scoping
- Guiding principle: constructive alignment and How People Learn (HPL) Framework
- Example implementations: translating principles into practice
- Online assessment tools
- Flipped Assessment
- Tips to keep in mind when designing assessments
- Q&A

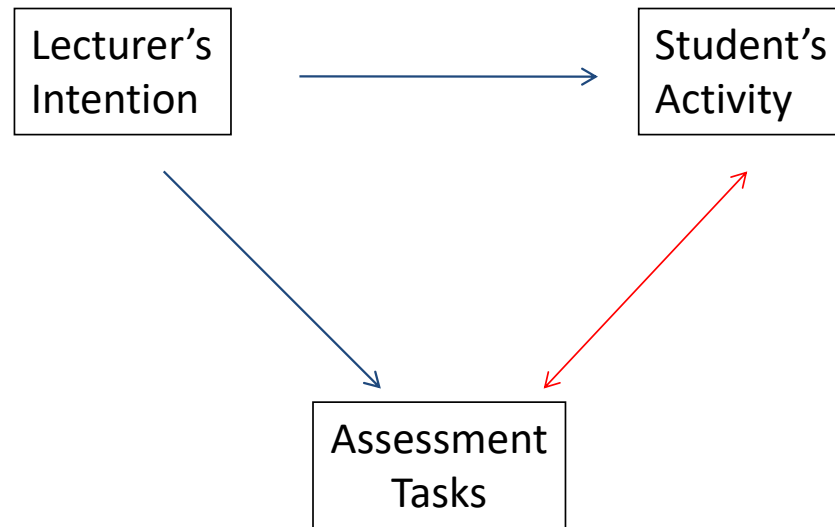
Things to think about...

- Purpose of the assessment (Why)
- What to assess
- How to assess
- Who will do the assessment
- Suitability of the assessment for the students

Guiding principle: Constructive Alignment (John Biggs, 1999)

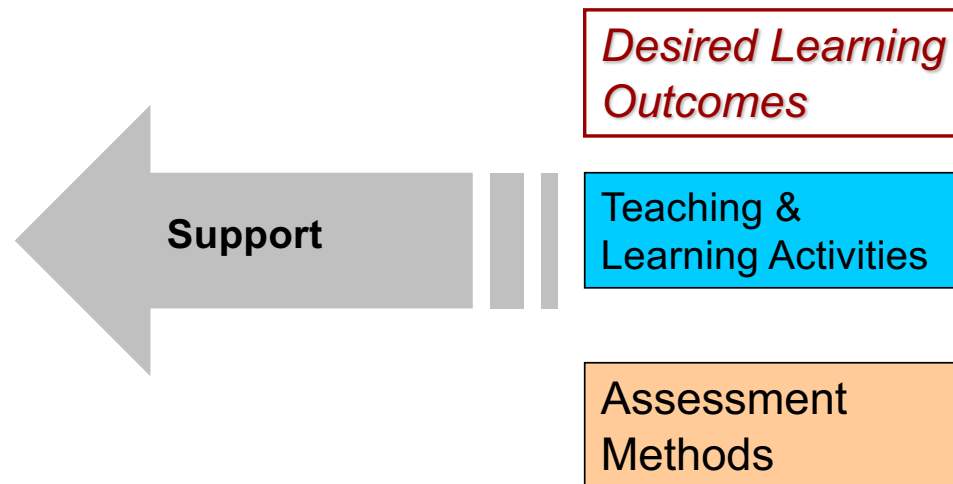
Intended outcomes must clearly
be indicated

Teaching and learning
activities match outcomes



Assess intended outcomes

Constructive Alignment (Biggs)



Ensuring learning outcomes

From Strobel, 2008

Open book or take home written tests

- Eliminate the possibility of students finding answers online
- Open-ended questions, which may have:
 - Provide choices or options in coming up with the answer
 - Simulation or programming components
 - Various possible design or solution for the answer
 - Real-world problem

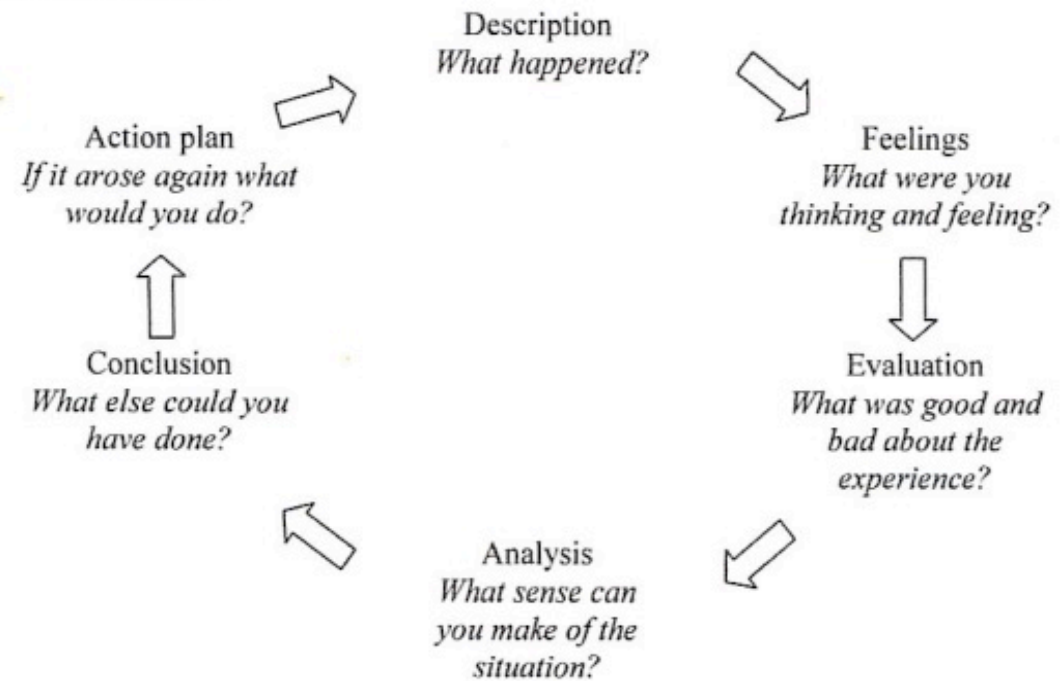
Sample question for a take-home quiz

- A pot of water is boiling on a stove. Calculate the degrees of freedom and develop a mathematical model.

Models of Reflection

Reflection

Gibbs Reflective Cycle:



Which Alternative Assessment You Want to Give A Try?

www.menti.com : 30 10 20

Q & A Session

www.menti.com 30 10 20

Let's write your own Reflection for this session:

<https://padlet.com/krdutp/AA>



Thank You

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