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Blended use of Technology-enhanced formative assessment and classroom reasoning tasks for developing higher-thinking skills

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1. Study objective
2. Analytical framework & study design
3. Course background
4. Design of technology-enhanced formative assessment tasks (TEFA) to support higher-order thinking
5. How did students respond to TEFA?
6. Discussion – design principles of TEFA that support higher-order thinking

Outline

1. Study objective



Overall Aim:

- ◆ To explore how students' development of higher-order thinking skills (HOTS) can be supported through the blended use of technology-enhanced formative assessment (TEFA) tasks and classroom reasoning (CR) tasks
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2. Analytical framework & study design

◆ “The use of **ICT** to support the iterative process of gathering and analysing information about student learning by teachers as well as learners and of evaluating it in relation to prior achievement and attainment of intended, as well as unintended learning outcomes.” (Pachler et al., 2010, p. 716)

- In this study we emphasise
 - ◆ The **interactivity** ICT brings into TEFA tasks for communicating assessment information and providing feedback in ongoing classroom **dialogues**

Technology-enhanced formative assessment (TEFA)

- *Framework of Three-Level Feedback Prompts*
- ◆ *Feedback on task*, such as facts to be processed for undertaking the task, and comments on correctness of response
- ◆ *Feedback on process* of task completion, e.g., task strategies and resources for completing the task
- ◆ *Feedback on self-regulation* of learning progress and quality of work-in-progress/end product
(Hattie, 2012)

TEFA tasks: analytical framework

- ◆ The cognitive processes of interpreting, analysing, and manipulating information for problem-solving, which are compared with lower-order thinking – the routine, mechanistic application of information (Lewis & Smith, 1993; Newmann, 1991a)
- ◆ Dr Lee will share more on specific HOT skills

Higher-order thinking

- *Six Minimal Criteria of Thoughtful Classroom*
 - ◆ Students are given *challenging questions/tasks*
 - ◆ Students are given *appropriate time* to reflect and prepare thoughtful responses to questions/tasks
 - ◆ Students are encouraged to *articulate explanations and reasons* for responses to questions/tasks
 - ◆ The teacher acts as a *model of thoughtfulness* (i.e., cognitive engagement with learning problems by applying high-order thinking skills)
- (Newmann, 1991b)

Teacher support for higher-order thinking: analytical framework

A small-scale investigation:

- Purposive sampling: 16 students of a tutorial class in a course emphasising HOT
- Pre- and post-test Classroom Feedback Experience Questionnaire (CFEQ) in Jan & May 2016
 - 44 close-ended questions, 2 open-ended questions
- End-of-course Critical Incidents Sheet (CIS)
 - 5 open-ended questions
- End-of-course focus groups: to be conducted in early June

Study design

3. Course background

- For all Year one students
- Attending lecture and tutorial every week
- ...Through the explanations and demonstrations provided, students will be inspired to participate as active thinkers in the disciplines and traditions of thought that constitute knowledge and understanding.

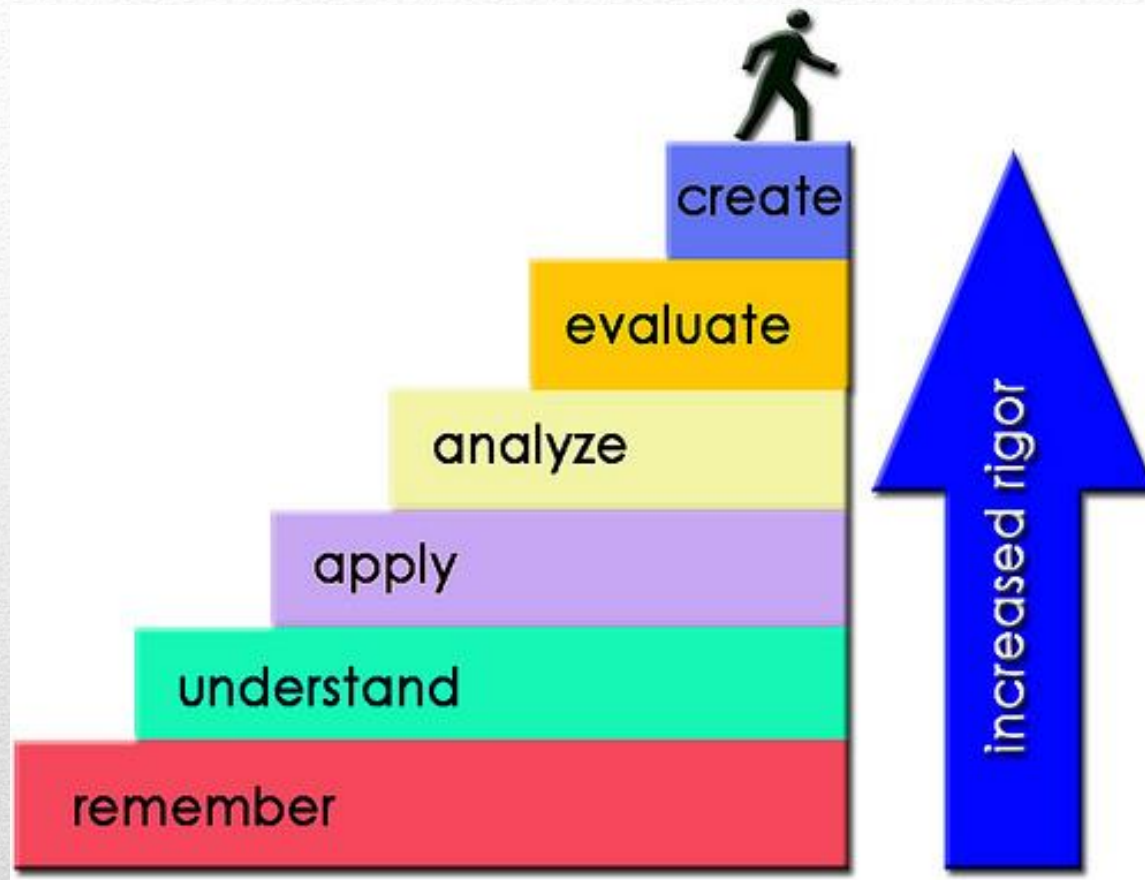
The General Education Foundation course

- CILO 3 **Demonstrate a commitment to thinking**, speaking and writing critically about a range of views and ideas;
- CILO 4 **Make meaningful connections** between the course content and their own beliefs, values and goals
- ...Through the explanations and demonstrations provided, students will be inspired **to participate as active thinkers** in the disciplines and traditions of thought that constitute knowledge and understanding.

Course Learning outcomes related to higher-order thinking



4. Design of technology-enhanced formative assessment tasks (TEFA)



Purpose of using technology

Topic	ICT	Pedagogical purpose
1. Every lecture - Lecture summary	Moodle	Whole class discussion / Instructor feedback
2. Every module - e-journal	Mahara	Assessment / Instructor feedback
3. What makes us human	Digital resources (Optical illusion)	Creating cognitive dissonance for discussing the use of evidence
4. Good governance	Video production with mobile phone	Retelling main points as a whole story
5. Basic Law education	Google form (Online quiz)	Looking into different aspects of Basic Law
6. Teacher professionalism	Online resources (Songs / movie trailer)	Exploring public views of teachers
7. Project We Can	Online resources (Video clip)	Exploring double loop thinking
8. Business plan in SE	QR code, Online resources	Problem solving task
9. Soccer and Globalization		
10. Home away from home	Online resources	Identify related concepts; linking concepts to tell story

Lecture Summary

Aspects	Key concepts/ contents	Reasoning
Population of Islam in China	Islam is a famous religion in China.	- There are 1.3 billion of Islamic and more than 20 million of Muslims (2% in China) - 56 ethnic groups in China include 10 Muslim nationalities
History of China and Islamic	China can be divided into different dynasties and periods to look through the histories and how Islamic appeared in China before the 66 years.	- Tang Dynasty: Islam entered China in 627 AD - Yuan Dynasty: Mongolian Rule (1278 – 1368) - Ming Period (1368 – 1644):
Daily life of Islamic in China	Demographic Characteristics	- Language: Most China's Muslims speak Chinese, as Hui as "Chinesespeaking Muslims"
Eating habit of Islamic in the other places	They still follow the rule to have their special meals.	They merely eat the hui food which is printed by a "Qing Zhen" logo. Even they are in Hong Kong or the other places, they keep have this habit.
Islam in Hong Kong	Hong Kong has some of the buildings and praying activities from Islam	- Mosque Built in Colonial Hong Kong E.G. Wan Chai Mosque/ Masjid Amar & Osman Ramju - Non Han Chinese in Postcolonial Hong Kong: Ethnic Muslim Minorities - Muslim prayer room in CityU, Halal canteen in HKU and also CUHK starts Islamic project to let people to know deeply about Islam.
Types of Islam	Two types of Islam are in this world, they are Good and Bad Islam	Why Islam would be named by "Bad Islam" is because there are some people who are utilizing Islam to brainwash Islamic and then encourage them to achieve their bad goals. E.G. IS(The Islamic State), a terrorist organization.

What was the main message the speaker want to tell you?

Recall the content of the lecture and discuss

- How can we nurture students' positive learning attitude?
- How can we nurture the students' positive behaviours?
- How can we develop the students' ability to facing adversity?

Lecture summary for discussion

- You are the TV reporters and you have jotted some notes from a seminar about good governance
- Based on the notes, write a news report script to cover the main point of the seminar in less than one minute.
- You need to give the script a caption title.
- Video-tape your news report.

Theme: Good Governance and Auditing

News reporting...

How a “teacher” is described?

- When you listen to the song, try to write down as much as the descriptions of a “teacher”.
- “So you want to be a teacher” :
<https://www.youtube.com/watch?v=YAOjUeQVXMM>

Looking from a different lens

5. How did students respond to TEFA?

Classroom interactions	Mean	SD	Classroom interactions	Mean	SD
Hearing other students explain in their own words in the small groups helps me to learn	3.73	0.704	Group discussions are usually followed by whole class discussions	3.87	0.99
	3.73	0.647		4.00 ↑	0.632
Everyone in the small groups usually has opportunities to express opinions	4.13	0.834	Having to answer questions in class makes me pay more attention	3.93	1.1
	4.00 ↓	0.447		4.18 ↑	0.405
Discussion in whole class helps me understand the subject matter	3.8	0.941	It is important for teacher to explain the right answers and reasons clearly	4	0.756
	3.82 ↑	0.405		4.27 ↑	0.467
Whole class discussion is an important part of the class	3.8	1.207	It is important for teacher to understand students' difficulties in learning the topic	4	0.632
	3.82 ↑	0.751		4.33 ↑	0.577

Results from CFEQ (n=16 / 11)

Teacher & peer-feedback	Mean	SD	Teacher & peer-feedback	Mean	SD
Teacher often gives feedback in class	4	1	My classmates and I often give each other feedback when working in small groups	3.6	0.986
	4.27 ↑	0.467		3.73 ↑	0.786
Teacher feedback in class focuses on how to improve strategies for tackling tasks	3.73	1.1	Hearing classmates' explanations of answers in class often gives me helpful hints	4	0.845
	4.00 ↑	0.447		3.82 ↓	0.751
Teacher feedback in class raises my awareness of task goals/assessment standards	3.8	1.014	Peer feedback in class raises my awareness of task goals/assessment standards	3.67	0.976
	3.73 ↓	0.467		3.82 ↑	0.603
Teacher feedback in class provides me with strategies for monitoring my learning process	3.87	0.915	Peer feedback in class provides strategies for monitoring my learning process	3.67	0.9
	3.90 ↑	0.316		3.91 ↑	0.539

Results from CFEQ (n=16 / 11)

Teacher support for higher-order thinking skills	Mean	SD	Teacher support for higher-order thinking skills	Mean	SD
Students are given appropriate time to reflect and prepare responses to questions/tasks	4	0.756	Students are encouraged to explain and give reasons for responses to questions/tasks	3.73	0.884
	3.82 ↓	0.405		4 ↑	0.000
Students are given opportunities to exchange ideas with other students in tackling questions/tasks	3.73	0.961	The teacher helps students to understand the topics by demonstrating worked-out problems	3.93	0.884
	4.27 ↑	0.467		4.27 ↑	0.467
Overall comment			Mean	SD	
Overall, I am satisfied with classroom experience in the GE Foundation course			3.64	0.884	
			4 ↑	0.000	

Results from CFEQ (n=16 / 11)

Questions	Examples of student responses	Inferences
1. Can you give an example of the moments when you were most engaged in this course? Results from CIS (n=11)	- Using technology in tasks (n=2): ➤ video production in which students played the role of journalists to discuss a topic in depth ➤ watching pictures of animal footprints in a video and discuss double loop thinking - Learning about core concepts of the course (n=2) - Engaging with peers in group tasks and whole-class discussions (n=7)	<u>Students valued TEFA tasks</u> designed to apply higher-order thinking skills (n=2) - Students were engaged in <u>thinking with technology enhanced tasks</u> (n=2) <u>Peer interactions in group and whole-class tasks/discussions</u> involved students actively in classroom learning (n=7)

Questions	Examples of students' responses	Inferences
2. What happened? Why did you feel engaged? Results from CIS (n=11)	• Technology in tasks: ➤ interaction with peers (n=1) & deep exploration of topics (n=1) • Learning core concepts: ➤ Feeling engaged or excited when learning to think about the concepts (n=2) • Peer interaction: ➤ Group members' mutual engagement (n=2) ➤ Peer interaction was fun (n=1) ➤ Exchanging diverse viewpoints (n=3) and enhancing basic knowledge (n=1) ➤ Teacher guidance on how to think over topics in depth (n=1)	The sources of engagement: • <u>Opportunities to interact with peers</u> (n=6) • <u>The positive emotions</u> (fun, excitement, happiness, interest) aroused by learning concepts (n=2) and peer interactions (n=2) • The insights gained from <u>peers' diverse perspectives</u> • The <u>guidance by teacher on the thinking process</u> in approaching topics (n=1)

Questions	Examples of students' responses	Inferences
3. Did you get any feedback if you were working on a question/task? Who gave it? Results from CIS (n=11)	- Obtaining feedback from teacher (n=11) - Obtaining and giving feedback from/to classmates (n=2)	- All 11 students were conscious of <i>teacher feedback</i> - Just two of the 11 students mentioned <i>peers' feedback</i>

Questions	Examples of students' responses	Inferences
4. What feedback did you receive? 5. Was it helpful for you to understand the subject matter better? Why / why not? Results from CIS (n=11)	- Teacher's feedback was detailed (n=1) - Teacher/peer feedback was relevant (n=1) - Teacher/peer feedback provided many possible ideas (n=2) - Teacher's further questions helped me to <i>think</i> in more depth / in other directions (n=2) - Teacher feedback helped with self-evaluation on my opinions (n=1) (<i>Divergent thinking, evaluating ideas</i>) - Teacher feedback helped me to <i>structure</i> my presentation (n=1) - Teacher/peer feedback helped to <i>structure</i> my point of view about an issue (n=1) (<i>Organising and synthesising ideas</i>)	Feedback was helpful when: - It was <i>detailed, specific, and relevant</i> (n=3) - It provided <u>hints for thinking</u> in more depth, in different directions /from multiple perspectives (n=3) - It provided <u>hints for organising ideas and self-evaluating ideas</u> (n=2)

6. Discussion – design principles of TEFA to support higher-order thinking

Pedagogies

- Students collaboration
- Progression
- Design tasks in context
- Teacher facilitation
- Focusing *feedback on all three levels* – task information, learning strategy, and self-regulation

Technology

- Easy to use
- Simple technology
- *Ready-to-use* technology, e.g. moodle
- Ready-to-use resources

Design principles

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