



Understanding Students' Cognitive Complexity through a Narrative Qualitative Analysis: a Pilot Study

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Abstract

Narrative Qualitative Analysis (NQA) was developed as the first objective (i.e. based on the teacher's evaluation) and qualitative (i.e. not on Likert scales) assessment tool for the General Education Foundation (GEF) Programme from 2014 to 2017. NQA aims to evaluate and understand students' ability analyzing students' writing assignments. A good understanding of the students' ability would help the teacher cultivate an appropriate learning environment and design suitable learning environment of cognitive complexity is divided into four key steps. Correspondingly, there are five thinking performance patterns. In this poster, we will present the two main results from our pilot study. Firstly, by comparing the NQA result from teachers' evaluation with students' self-evaluation of their thinking performance patterns, it is discovered that students generally overate their cognitive complexity. Secondly, through a systematic NQA study on students' writing assignments, it is found that most students are clustered in the lowest two levels of thinking performance patterns. Furthermore, the study also highlights some common characteristics of students' thinking, which may provide clues for teaching improvement.

Background:

GEF Courses and the NQA Project

- Y The two GEF courses, In Dialogue with Humanity and In Dialogue with Nature, two compulsory general education courses for all CUHK undergraduates, are reading and writing intensive. Students are required to read assigned classics and participate tutorial discussions on weekly basis; then they need to integrate their understanding and interpretation to address some enduring open-ended questions in writing assignments. With such course designs, the GEF programme aims to promote students' academic preparedness and confidence in cognitive capabilities, including reading, writing, communication and critical skills.
- ✓ To evaluate and improve the teaching, a research through Narrative Qualitive Analysis (NQA) was carried out from 2014 to 2017 in the GEF programme. This NQA project was developed from the Wolcott-Lynch Model, and the main findings were published in the final report. The current poster will report some preliminary results based on an extended study of the NQA project.
- ✓ The uniqueness of NQA study is that it enables an objective and qualitative evaluation of students' cognitive capabilities, providing a valuable supplement to the widely-adopted course teaching evaluation (CTE), which is mainly quantitative and based on students' self-reflection. The NQA project focused on evaluating students'





cognitive complexity, containing essential skills aimed by the GEF programme as well as University education.

Methodology:

Student Self-evaluation plus Teacher's Evaluation

Student Self-evaluation

Term Start:

At the beginning of the term, the course teacher introduces the Wolcott-Lynch model, and the students are invited to self-evaluate their overall thinking performance patterns voluntarily based on the criteria provided by the model.

Theoretical Tools: Wolcott-Lynch Model & Thinking Performance Patterns

Wolcott-Lynch Conceptual Model

STEP 0: FOUNDATION Knowledge and Skills

- Repeat or paraphrase information from textbook, notes, etc.
- Reason to single "correct" solution, perform computations, etc

STEP 1: IDENTIFY the Problem, Relevant Information, and Uncertainties

- Identify problems & acknowledge reasons for enduring uncertainty & absence of single "correct" solution
- Identify relevant information and uncertainties embedded in the information

STEP 2: EXPLORE Interpretations and Connections

- Interpret information
- Recognize and control for own biases
- Articulate assumptions and reasoning associated with alternative points of view
- Qualitatively interpret evidence from a variety of point of view

Teacher's Evaluation

Term Middle: Reflective Journal Evaluation

After collecting students' reflective journals, the course teacher analyzes each student's individual thinking performance pattern as demonstrated in the writing.

For each writing assignment, the course teacher needs to:

- evaluate the student's overall thinking performance pattern based on his/her writing;
- highlight *individual weakness and improvements* as demonstrated in the writing;
- write free comments when necessary

Data were collected from an In Dialogue with Nature class in 2016-2017 Term 1. 75 students joined the voluntary selfevaluation, and 95 students were evaluated twice by the course teacher in the middle and the end of the term. All data are put together for further analysis.

patterns individually.



提高思考能力的步驟:表現模式←

←低複雜度	表现模式	高複雜度表现	高複雜度表現模式→」			
表現模式 0 コ	表現模式 1 э	表現模式 2 э	表現模式 3 コ	表現棋式 4 -		
"Confused Fact-finder"」	"Biased Jumper" э	"Perpetual Analyzer" э	"Pragmatic Performer" コ	"Strategic Re-Visioner"		
整 體的問題處理方法: ⊃		整體的問題處理方法:→	整體的問題處理方法: →	整體的問題處理方法: 3		
認爲目標是找到單一的 "正		認為目標是在不同角度的證據	認為目標是在對不同答案客觀	認為目標是創建知識,以便		
確"答案 」	<mark>支持自己的结論</mark> ⊃	和訊息的基礎上建立一個中	比較的基礎上建立自己扎實的	來能逐步得到更好的、或更		
	」	立、平衡的觀點」	觀點 -	信心的結論。		
常見的弱點: ; • 不能現實地感知不確定性/疑 難點; • 好像完全不明白討論的重 點; 以為開放性問題也有單 一 "正確"答案的問題; • 堅持認為教授、課奉,或者 專家應該提供"標準"答案; • 表現出困惑或挫敗; • 會使用不合邏輯或自相矛盾 的論證;	在表現模式 0 基礎上的主要提 升: 3 • 能意識到長遠不確定性的存 在,並意識到多角度看問題 的合理性 3 • 可以有過輕地使用證據來支 持自己的結論 3 5 常見的弱點: 3 • 很快跳去結論 3 • 大量堆砌支持自己觀點的證	在表現模式1基礎上的主要提 升:] • 針對問題能給出一個自洽、 平衡的描述,並能了解問題 出現的背景] • 能指出不同觀點對應的問 題、假設和存在的偏見] • 有意識地控制自己的偏見] • 能從不同觀點中提取符合遇 輯、且高質量的證據]	在表現模式 2 墓礎上的主要提 升:] • 深入探討后,有意識地對問題與資訊進行排序] • 能清晰有效地支持所選擇的 答案,並能客觀地考慮其它 可能性] • 在決策及執行過程中能有效 吸收他人意見]] 常見的顧點:]	在表現模式3基礎上的主要 升: 」 • 能有效給出優先權並處理. 種局限 」 • 在獲得新咨詢時,能隨著 間系統地詮釋或重新詮釋 有的知識主體。 」 • 展現出一種長期的、有策 性的視角 」 • 針對問題,能同時考慮新 可能解決方式 」		
 不能很好地評核或恰當使用 證據 3 不恰當地引用課文、 "事 質"或定義。 3 基於未經檢驗的專家意見或 單態感覺就得出結論 3 	 據御完全忽略負面的證據→ 把未經證實的個人觀點當作 有效證據使用→ 不能將問題細化和無法理解 不同的角度→ 堅持認為所有的意見都是同 樣有效的,但忽略或完全死 考慮和自己不同的其它觀點→ 認為專家都有自己的偏見, 或者嘗試說服別人接受自己 	常見的解點: 3 •無法在不同選擇之間做出優先排序 5 •主觀上不願意選擇某一個答案並為之辨護,或者無法為答案提供充分的證據 3 •嘗試展示全方位的分析,以致文章寫得不必要的長(對問題無法優先排序) 3 •常常到結于定義,以致損害	 結論中沒有充分注意到長期的、策略性的問題。 不能指出並處理結論的局限及"下一步"的工作。 	Xample		

Preliminary Results:

Overall Thinking Performance Patterns

The mean value of student self-evaluation(1.73) is almost one level higher than that of the teacher's evaluation based on the NQA study, which suggests that students tend to overrate their thinking performance patterns.

NQA analyses consistently reveal that about 80%





STEP 3: PRIORITIZE Alternatives and Implement Conclusions • After thorough analysis, develop and use reasonable guidelines for prioritizing factors to consider and choosing among solution options Efficiently implement conclusions, involving others as needed

Students' cognitive complexity was scaffolded into four sequential steps with corresponding characteristic thinking skills, namely, identifying, exploring, prioritizing and envision. Better performance in the lower-level steps supports achievement in the higher-levels, more complex **<u>STEP 4</u>**: ENVISION and Direct Strategic Innovation • Acknowledge, explain, and monitor limitations of endorsed solution

Integrate skills into on- going process for generating and using information to guide strategic innovation



In real situations, when addressing an open-ended problem, students often employ all thinking steps simultaneously. Given the self-scaffolding nature of the model, unsatisfactory performance in lower-level thinking steps often affects the performance in the higher-level thinking steps. Consequently, we can classify students into five thinking performance patterns.

Wolcott-Lynch Thinking Performance Patterns

Steps for Better Thinking Performance Patterns

of students belong to the lov	west two t	thinking	20.8		7.9	50.0	
performance patterns. The	result	is also			1		% % % %
comparable to the original Wolcott-Lynch study					4 11.1	0.0	
on students in US universities.		LEVEL o:	LEVEL I:	LEVEL 2:	LEVEL 3:	LEVEL 4:	
	Mean Value	Total No. of Students	CONFUSED FACT- FINDER	BIASED JUMPER	PERPETUAL ANALYZER	PRAGMATIC PERFORMER	STRATEGIC RE- VISIONER
Student Self-evaluation	I.73	75	5	27	27	15	Ι
NQA Project	I.0	48	ΙΟ	30	6	2	0
Reflective Journal Analysis	I.04	95	23	50	17	5	0
Term Paper Analysis	0.97	95	24	51	19	I	0

Term End: Term Paper Evaluation

After students submit their final term papers, the

course teacher will again apply the Wolcott-lynch

model to analyze students' thinking performance

There observes NO statistical difference on the distributions of overall performance patterns between the Reflective Journal analysis and Term Paper analysis. This result is consistent with the Wolcott-Lynch statement that a level-improvement on average requires 2 to 3 years of practice. Comparison between the Reflective Journal and Term Paper analyses for individual students confirms the same result.

Other than overall patterns, we also investigated individual components in every thinking performance pattern, which reveal more detailed descriptions of the cognitive complexity of our students. The discovered patterns will help the teacher to design classroom activities and assessment within the zone of proximal development (ZPD) on the cognitive capability of students, which can improve the effectiveness of the teaching as well as students' learning experience.

Distribution of Students' Individual Changes in Performance Patterns (with Percentage and Standard Normal Distribution Superimposed)



Preliminary Results:

120

Patterns of Individual Thinking Performance Components

Students' Achieved Improvement in Every Thinking Performance Pattern

RJ Number of Students TP Number of Students RJ Percentage of Students 66.3%

TP Percentage of Students



80%



References and Acknowledgement: CHAN H.Y. et. al., Qualitative Narrative Assessment of Two Dialogues at The Chinese University of Hong Kong, Submitted to https://www.coretexts.org/institute/assessment-project/. The authors would like to thank the NQA project.