Kiruthika Ragupathi, NATIONAL UNIVERSITY OF SINGAPORE, kiruthika@nus.edu.sg
Zi Hui Yeo, NATIONAL UNIVERSITY OF SINGAPORE, zihui-yeo@nus.edu.sg
Hui Chieh Loy, NATIONAL UNIVERSITY OF SINGAPORE, loyhc@nus.edu.sg

Promoting Critical Thinking and Learning in a Large-Enrolment Humanities Course

A Case Study

ABSTRACT

To promote the development of critical thinking abilities in an introductory undergraduate humanities course in the context of mass higher education, we implemented a course design that employed a series of scenario-based multiple-choice questions (MCQs) and informal peer discussions. Using an online survey to gather perception data and self-reported behavioral data, this study examines the extent to which the course design was effective at promoting critical thinking and student experience. Deductive analysis of students' qualitative responses indicate that the course design was successful in promoting students' development of critical thinking. Both deductive and inductive analysis of students' qualitative responses also suggest that students largely had favorable attitudes towards this course design, though there are also some who express concerns. Our design may be useful for instructors and instructional designers aiming to promote critical thinking and learning in university courses.

KEYWORDS

Multiple-choice questions, formative assessments, higher-order thinking, humanities education, informal peer learning

INTRODUCTION

Mass higher education is increasingly common in many countries, with some researchers attributing a decline in the quality of instruction to its emergence (Tight 2019; Trow 1999). One reason posited for this decline is that instructors have reduced opportunities for interacting and engaging with individual students (Hornsby and Osman 2014; Monks and Schmidt 2011). The reduced opportunity for interaction is an especially pressing problem for the humanities, as these subjects typically aim to expose students to contending theories and multiple perspectives, dialogue, and debating of ideas (Neumann, Parry, and Becher 2002).

Humanities instructors in large-scale university courses, therefore, need to focus on efficient pedagogical and assessment strategies (Biggs 1996; Hornsby and Osman 2014). Just as importantly, they need strategies that encourage students' active engagement with and interest in the subject matter of the course (Freeman et al. 2014; Niu, Behar-Horenstein, and Garvan 2013).

This paper outlines two pedagogical strategies—scenario-based multiple-choice questions (MCQs) and informal peer learning—as part of the course design employed in a large-enrolment humanities course and highlights how these strategies promoted and enhanced critical thinking in the

context of mass humanities education. While the two strategies are analytically distinct, they are intertwined in their implementation in the design of the course and are intended to reinforce each other. Following the scholarship of teaching and learning advocated good practice (Felten 2013) as a guide to frame our inquiry, we sought student input on their attitudes, behaviour, and perceptions towards the impact of course design on their understanding of the subject.

The two questions that guide our study are:

- To what extent does our course design promote students' critical thinking and understanding?
- How do students describe the quality of their learning experience in relation to our course design?

Critical thinking

Critical thinking is the 'intellectually disciplined process of actively and skilfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action' (Scriven and Paul 1987, 1). We operationally define critical thinking using Wiggins and McTighe's (2005) six facets of understanding, as these six facets are also ways in which critical thinking may be instantiated; Wiggins and McTighe propose that to understand *x*, where *x* may be a concept, issue, or an argument, is to be able to (1) describe *x* (explanation), (2) make meaning of information relevant to *x* (interpretation), (3) think through contexts where *x* is invoked using various viewpoints (perspective), (4) use knowledge about *x* in new or diverse situations (application), (5) go inside another person's feelings or worldview in relation to *x* (empathy), or (6) understand the limitations of one's knowledge about *x* (self-knowledge). Following Wiggins and McTighe, we take the view that none of these components for critically thinking about *x* is necessary for other components for critically thinking about *x*, and a student does not need to be able to describe *x* before she is able to apply *x* in a new situation.

The ability to think critically is traditionally considered a significant outcome of higher education. Employers, too, acknowledge the value of critical thinking in the workplace (Burbach, Matkin, and Fritz 2004; Casner-Lotto and Benner 2006). Given this central role that critical thinking has in higher education, the acquisition and development of critical thinking abilities need to become a centrepiece of course design (Hansen 2011). Universities and educators, therefore, need to adopt various pedagogical interventions that support the development and practice of critical thinking skills (Niu, Behar-Horenstein, and Garvan 2013).

Scenario-based multiple-choice questions

MCQs, when designed well, can effectively measure students' learning and cognitive skills. Given appropriate conditions, they can be even more effective than traditional assessment methods, such as essay-writing, for specific purposes (Azer 2003; Goodwin and Machin 2016; Moeen-uz-Zafar-Khan and Badr Muhammad Aljarallah 2011). However, while the use of MCQs is prevalent in medical and science education, the same cannot be said in humanities education. In fact, it is common to find contenders against the use of MCQs in the humanities, citing a perceived inadequacy for assessing students' critical thinking abilities and learning outcomes (Nicholas and Labig 2013). Some also argue that MCQs discourage the use of deep learning strategies compared to essays (Scouller 1998). These arguments likely stem from the widespread assumption that MCQ tests cannot assess students' higher-

order thinking skills and are only suited for testing lower-level intellectual processing such as content recall (Scouller 1998).

While there is some merit to the naysayers' arguments, important distinctions need to be made. Indeed, if the point is to assess students' ability to, for instance, independently express a chain of complex reasoning in a longer format, then obviously MCQs will not do. But it is not true that MCQs can only test for content recall. In fact, well-designed scenario-based MCQs that adopt a problem-based learning approach can be used to test students' grasp of concepts, application of knowledge acquired, and other associated higher-order thinking skills such as integration of knowledge, evidence-based decision making, and interpretation of evidence and of the problem (Azer 2003; Goodwin and Machin 2016). So, while MCQs are clearly not suitable for every type of learning and assessment in the humanities, well-designed MCQs should not be ruled out as powerful instruments in every humanities educator's toolkit.

Informal peer learning

Peer learning refers to the learning that takes place when students work together collectively in small groups on academic tasks, take on shared responsibilities to accomplish common goals, and develop mutual knowledge and skills (Topping et al. 2017), typically in the absence of an instructor. Dialogues and social interactions in a peer learning setting can function as scaffolds for those students who are not yet able or fully motivated to independently exercise critical thinking abilities to the standard demanded in the classroom (Vygotsky 1978).

In broad terms, peer learning takes place through peer discussions (Chi et al. 2001; Gillies 2015; Roscoe 2014), but the discussions can also be further understood as activities of explaining, arguing, and disagreeing (Topping et al. 2017). By informal peer learning, we mean peer learning that takes place through students' informal interactions, rather than in a formal setting (e.g., in a classroom).

The extent to which students participate in the discussions—i.e., their ability to provide propositions and explanations (Topping et al. 2017) as opposed to a final answer—affects the gains in understanding during peer discussions and subsequent student performances on tests and examinations. Also, such learning gains can be achieved only when students use explanations and knowledge gained to subsequent tasks (Webb, Troper, and Fall 1995).

In the absence of an instructor who can facilitate peer discussions, the difference in opinions between students that often occur can give rise to confusion and, at times, cause students to doubt their own competence. However, such disagreements also push students to regulate conflict (Butera, Darnon, and Mugny 2010), and this process promotes greater metacognitive awareness which is necessary for individual learning (Howe 2015). These peer interactions, therefore, help students develop cognitive skills, knowledge, and understanding (Falchikov 2003).

Eddy et al. (2015) also noted that there is a danger of some students becoming excluded in peer discussions or experiencing anxiety because they either compare themselves poorly against their peers or are perceived by group mates to be so. In any case, students are likely to engage in discussions only if they believe that they will gain value, or that their participation can result in achievement of their goals (Eddy et al. 2015). Furthermore, peer learning settings open up the possibility for students to free ride, engage in unhealthy competition, and can result in unequal outcomes on account of accidental peer characteristics (Le, Janssen, and Wubbels 2018). But even as these challenges exist, informal peer

learning offers students the space to critically inquire and reflect in a group setting and to learn how to learn and work in groups (Calkins, Grannan, and Siefken 2020).

STUDY CONTEXT

This study was conducted in a large-enrolment introductory course to philosophy taught at a large research-intensive public university in Singapore. The course has an average enrolment size of 400–500 students each academic semester (13 weeks). Even though the course functions as the gateway course to majoring in philosophy, most of the students (95%) do not take the course with the intention of majoring; rather, they elected to take the course as an option to fulfil a general education requirement. Every week, students attended a two-hour lecture conducted by an instructor and a one-hour tutorial conducted by a tutor, typically a graduate student.

The assessment format is made known to students through the learning management system and explained during the first lecture. The specific assessment component of interest here is the weekly scenario-based MCQ quizzes: a series of formative, individually assessed, open-book MCQs administered online for 10 weeks. They are designed to be relatively low stakes—the best nine scores are counted for a total of 36.0% of the overall grade. The intention is to use them formatively, to encourage students to focus on learning across the 10 weeks. They test students on the material discussed in the previous week's lecture and coincide with the current week's tutorial topic. Students may submit their answers over the entire week. Answers and detailed explanations are published after the quiz has closed. At the end of the semester, a summative, in-person, two-hour, individually assessed, open-book MCQ examination which accounts for 40.0% of students' final grades is administered. Since the examination makes use of MCQs of a similar nature, the weekly MCQs also prepare students for the timed final examination.

This study focuses on two specific features of these weekly MCQ quizzes. The first is that they typically consist of eight scenario-based MCQs that are deliberately formulated as mini "stories," portraying imagined student characters discussing the concepts covered in the course. To discern the correct option (one out of four), students must not only recall the definitions of relevant concepts introduced in the readings and lectures, but they must also draw precise logical implications from the definitions taught and apply those definitions accurately to the scenarios depicted (see supplementary materials 1 for an example). The story elements of the question embed concepts taught in a lively setting which forces students to weigh whether a story detail is essential to the application of specific concepts. The MCQs thus approximate reasoning in the messiness of the real world even while each question is carefully constructed to ensure a determinate answer—every incorrect option implies a commonplace misunderstanding or tempting misapplication of a concept taught. New sets of questions were constructed for every iteration of the course. While some of the underlying ideas may persist, they are placed into new story scenarios. The weekly MCQs are not only a way for students to regularly gauge whether they have mastered the concepts taught but are also a way for students to acquire the skills necessary to tackle scenario-based thinking over time.

The second feature of concern to this study is the way that these weekly scenario-based MCQ quizzes are administered to encourage and create a persistent context for student informal peer learning. Throughout the semester, students are encouraged to clarify their doubts and misconceptions during the tutorial with the tutor or by emailing the instructor. To motivate student engagement and learning, responses to student enquiries and detailed explanation for the weekly MCQs are posted to a course

blog. Beyond these mechanisms, students are frequently encouraged to form peer study groups themselves to discuss the weekly quizzes informally, even though the submissions are made and assessed individually. Many students also quickly discover from the first quiz and subsequently published answers and explanations that it is much harder to score in the quizzes than they originally anticipated. Given their natural desire to score well for the course, many students are thus incentivised to seek out peers to engage in informal peer discussions to increase their chances of scoring well. Nonetheless, given that peer discussion is ruled out during the higher-stakes final examination, students also have the further incentive to engage in genuine learning and thinking during discussions, rather than merely treat them as expedient strategies, so that they can properly prepare for the final examination.

METHODS

Procedure

Participant recruitment

An online survey was sent out between September and November 2019 to all 1,732 students who were enrolled in the course between 2016 and 2019. Students from the 2019 cohort were renumerated with an extra credit point for participating in the survey. Only researchers with no dependent relationship with the participants were involved in participant recruitment, data collection, and data anonymisation (i.e., merging academic performance data with survey responses) processes. All further analysis was performed on the de-identified data.

Seven hundred and eighty-five students (785) consented to participate in the study and responded to the survey. Student matriculation numbers were requested within the online survey so that each response could be verified to confirm that only students enrolled in the course participated. The majority of the students (394) took the course in 2019. One hundred and twenty-six students (126) took the course in 2018, 102 students took the course in 2017, and 163 took the course in 2016. The survey was conducted in English and approved by the university's Institutional Review Board.

Materials

The survey had 12 questions in total (see supplementary material 2 for the complete list of survey questions). Only three were used for the current study. The rest of the questions were not pertinent to or useful for the research questions pursued in this study and will be used for other papers. The first of the three questions used was a quantitative question that categorised students into either "collaborators" (those who participated in informal peer discussions for the weekly quizzes) or "non-collaborators" (those who did not participate in informal peer discussions for the weekly quizzes). The remaining two questions were qualitative in nature, and each was posed to collaborators and non-collaborators respectively:

1) Please elaborate on your impressions about the open-book quiz format with peer discussions and its impact on your learning, including positive elements, concerns, ambivalences, etc. Please provide examples of your experience, if possible, on what you did to engage or not engage in the discussions. (For collaborators)
2) Is there a reason as to why you did not engage in discussions? Please elaborate. (For non-collaborators)

Data analysis

To gather self-reported, behavioural evidence for the impact of course design on students' understanding of the subject, a categorisation structure adapted from Wiggins and McTighe's (2005) six facets of understanding was deductively applied to all comments made by collaborators. The six facets were further divided into sub-facets based on our expectation of what would happen in the context of the selected course. Both manifest content and latent content were analysed at this stage.

To gather students' perceptions towards the course design, comments were first deductively analysed for their general sentiments (i.e., positive, negative, ambivalent/neutral). Comments were categorised as generally positive/negative if (1) they explicitly state so or (2) they consist of more positive/negative elements than negative/positive elements. Comments were categorised as ambivalent/neutral if (1) they explicitly state so or (2) they consist of just as many positive elements as there are negative elements. Again, both manifest content and latent content were analysed at this stage.

Subsequently, thematic codes were inductively assigned to the manifest content of collaborators' comments on the course design and non-collaborators' comments about their reasons for not engaging in discussions. This was done to get an idea of students' perceptions towards specific aspects of the course design. In this phase, Attride-Stirling's (2001) multi-level theming method was employed: basic themes extract the lowest-order premises evident; organising themes group basic themes to summarise more abstract principles; and global (super-ordinate) themes encapsulate the main ideas of the organising themes. For all content analyses, samples of data were coded independently by five research assistants. Thereafter, the codes were triangulated by the lead researchers to boost internal validity.

FINDINGS

Five hundred and eighty-one participants (74.0%) were identified as collaborators and the rest (204, 26.0%) identified as non-collaborators. Among collaborators, 481 (82.8%) responded to the qualitative item on the quiz format and peer discussions, while 194 (95.1%) non-collaborators responded to the qualitative item on their reason(s) for not participating in peer discussions.

Self-reported behavioural evidence that the course design promotes critical thinking

Of all 481 comments made by collaborators, 146 (30.4%) of them were too brief or did not respond to the question given (e.g., commenting on tutors or their overall experience taking the course instead of commenting on the course design). The remaining comments were analysed for respondents' perception of whether the course design improved their understanding of the course's subject. Most of these comments indicated that the course design improved one facet of students' understanding of the subject (192, 57.7%). Another 115 (34.5%) indicated that the course design improved two facets of their understanding, 24 (7.2%) indicated three, and the remaining two comments (0.6%) indicated four and five facets each. Table 1 summarises the evidence that the course design (scenario-based MCQ, informal peer discussion) increased students' perception that they understood the subject.

Table 1: Counts of students' self-reported behaviours vis-à-vis various aspects of critical thinking during informal peer discussions

Main facets	Description To understand x (concepts, ideas, arguments, etc.,) is to be able to…	Count	%	Sub-facets	Count	%
Explanation	Describe *x*.	243	37.9	Justifying or defending one's preferred answer option	128	20.0
				Teaching or explaining concepts or ideas taught in lectures	45	7.0
				Others	70	11.0
Interpretation	Make meaning of information about *x* through narratives, data, experiences, and translations.	94	14.7	Providing interpretation(s) of the quiz question vignettes or texts	59	9.2
				Providing interpretation(s) of materials/evidence in support of an answer option	26	4.1
				Others	9	1.4
Perspective	Critically think through contexts using various points of view to help answer a complex question or issue involving *x*.	260	40.6	Employing different theories or perspectives to help make decisions	158	24.7
				Resolving differences in interpretations or perspectives	100	15.6
				Others	2	0.3
Application	Use knowledge about *x* in diverse or new situations.	30	4.7	Applying concepts or ideas taught in lectures in more realistic, relevant contexts	9	1.4
				Others	21	3.3
Empathy	Go inside another person's feelings or worldview about *x*.	3	0.5	Appreciating the emotions or intuitions motivating a particular answer option, theory, or perspective put forth by peers	2	0.3
				Experiencing the tension or dilemma posed by the emotions or intuitions motivating different positions or theory	0	0.0
				Others	1	0.2
Self-knowledge	Understand the limitations of one's knowledge in understanding *x*.	11	1.7	Recognising one's own cognitive limitations	5	0.8
				Recognising that one's emotional investment or personal preferences and prejudices affects one's judgment or understanding	3	0.5
				Others	3	0.5
Total		641	100.0		641	100.0

Collaborators' perceptions of the course design

Results of the deductive analysis about the course design revealed that of the 481 collaborators, 378 of them provided comments that were generally positive, 28 of them provided generally negative comments, and 57 of them gave generally ambivalent or neutral comments. The remaining 14 collaborators provided comments that were unclear about their general sentiments towards the course design. In the following subsections, three global themes, their associated organising, and basic themes emerging from the inductive analysis phase are presented alongside positive (+) or negative (-) valence of the comments.

On peer discussion component of the course design

Comments by collaborators mainly focused on the peer discussion component of the course design. This global theme accounted for 79.9% of the total codes made in phase 2. Three organising themes and 32 basic themes were grouped to form this global theme (see table 2).

Table 2. Collaborators' comments on informal peer discussion component of the course design

Organising theme	Code count	Count (in %)	Basic theme	Valence	Code count	Count (in %)
Learning through peer discussions	517	67.5	Peer discussions exposed me to different perspectives.	+	160	20.9
			Peer discussions allowed me to clarify my doubts or expose misunderstandings/flawed reasoning.	+	139	18.1
			Peer discussions allowed me to increase, enhance, or deepen understanding of content.	+	91	11.9
			Peer discussions encouraged me to articulate my reasoning for my answers.	+	74	9.7
			Peer discussions allowed me to engage in or develop my ability to think critically about my peers' arguments.	+	7	0.9
			Peer discussions prompted us to critically reflect and learn more about ourselves.	+	4	0.5
			Peer discussions revealed limitations of my perspectives.	+	4	0.5
			Peer discussions allowed me to learn how others approached the quiz questions.	+	3	0.4
			Peer discussions allowed me to learn how to disagree with or challenge others in a socially acceptable manner.	+	2	0.3
			Peer discussions suit the nature of philosophy.	+	2	0.3
			Peer discussions gave me opportunities to become more open-minded/accept others' opinions.	+	2	0.3
			Peer discussions allowed me to understand how my peers thought about the topics taught.	+	1	0.1

			Peer discussions made me more confused or resulted in self-doubt.	-	26	3.4
			Doing the quizzes on my own was sufficient or better for my learning.	-	2	0.3
Enjoyment during peer discussions	170	22.2	Peer discussions helped me become more engaged in the course.	+	106	13.0
			Peer discussions were enjoyable or made the course enjoyable.	+	41	5.4
			Peer discussion enabled me to form new friendships.	+	17	2.2
			Peer discussions encouraged a positive, supportive learning environment.	+	4	0.5
			Peer discussions allowed me to express my point of view.	+	1	0.1
			I lost interest in the subject because the discussions were so confusing.	-	1	0.1
Peer discussions as collaborative effort	79	10.3	Peer discussions were intellectually stimulating/enriching.	+	8	1.0
			Open-book format allows for peer discussions to occur organically.	+	1	0.1
			Discussions were civil and genuinely cooperative.	+	1	0.1
			Value of peer discussions depends on chance attributes of peers (e.g., hardworking, capable).	-	17	2.2
			There were instances of free riding.	-	16	2.1
			Peer discussions were time-consuming.	-	13	1.7
			I get swayed by other people's opinions even if their answers were incorrect.	-	9	1.2
			I am disadvantaged because I am unable to find people with whom to discuss.	-	8	1.0
			Peer discussions make it difficult to accurately differentiate high-performing students from low-performing ones.	-	3	0.4
			There were saboteurs (e.g., confusing someone intentionally).	-	1	0.1
			I was not able to adapt to having peer discussions.	-	1	0.1
			I felt pressure to be always right during peer discussions.	-	1	0.1
Global total	766	100.0			766	100.0

On scenario-based MCQ component of the course design

Many collaborators also commented on the scenario-based MCQ component of the course design. This global theme accounted for 12.5% of the total codes made in phase 2. Two organising themes and 17 basic themes were grouped to form this global theme (see table 3).

Table 3. Collaborators' comments on scenario-based MCQ component of the course design

Organising theme	Code count	Count (in %)	Basic theme	Valence	Code count	Count (in %)
Suitability of MCQ format for learning philosophy	52	43.3	MCQs were fun or enjoyable to do.	+	21	17.5
			Additional hints/corrections provided were helpful in clarifying the questions.	+	6	5.0
			MCQs were intellectually stimulating/enriching.	+	4	3.3
			Open-book format, as opposed to closed-book, allowed for a deeper engagement with content.	+	3	2.5
			MCQ format restricted my ability to explain my point of view.	-	6	5.0
			The scenarios in the MCQs involved ambiguous/verbose language.	-	6	5.0
			The MCQs were time-consuming.	-	4	3.3
			The open-book format is not suitable for an introductory course to philosophy.	-	1	0.8
			The deadlines added on stress, taking away the joy of learning.	-	1	0.8
Learning through MCQs	68	56.7	MCQs emphasised conceptual understanding instead of memorization.	+	31	25.8
			MCQs required students to apply concepts to different scenarios.	+	21	17.5
			MCQs required me to engage in critical or logical thinking.	+	10	8.3
			The weekly MCQs trained me to not allow emotional investment in characters or personal beliefs to interfere with logical inferences.	+	2	1.7
			The weekly MCQs challenged our thinking about the concepts taught.	+	1	0.8
			MCQs required exegesis.	+	1	0.8
			MCQs required a relatively high level of conscious logical thought process.	+	1	0.8
			A logical approach seemed to benefit test-takers at the expense of higher order learning.	-	1	0.8
Global total	120	100.0			120	100.0

On the relationship between scenario-based MCQ and informal peer discussion components of the course design

Some collaborators also commented on the relationship between the two components of the course design employed. This global theme accounted for 7.6% of the total codes made in phase 2. Two organising themes and 10 basic themes were grouped to form this global theme (see table 4).

Table 4. Collaborators' comments on the relationship between scenario-based MCQ and peer discussion components of the course design

Organising theme	Code count	Count (in %)	Basic theme	Valence	Code count	Count (in %)
MCQs encourage discussions	31	42.5	MCQ format facilitated peer discussions.	+	10	13.7
			The difficult/tricky nature of the MCQs incentivised peer discussions.	+	8	11.0
			Peer discussions helped with or were crucial for solving the MCQs.	+	5	6.8
			MCQs were so difficult that (most of the time) discussions did not help.	-	7	9.6
			It is weird that students collaborate on something that is graded individually.	-	1	1.4
Discussions improve students' performance	42	57.5	Peer discussions helped me/my peers score better for the MCQs.	+	32	43.8
			Peer discussions prepared me for the final examination.	+	1	1.4
			The course design empowered me to take charge of my own learning.	+	1	1.4
			Peer discussions did not help me score better for the MCQs.	-	5	6.8
			Peer discussions bred complacency, resulting in students being unable to competently complete the final examination.	-	3	4.1
Global total	73	100.0			73	100.0

Reasons for not engaging in informal peer discussions

Of all the 194 comments made by non-collaborators, eight of the responses did not elaborate on why they did not collaborate. The remaining comments were analysed for the reasons given for not collaborating.

Non-collaborators broadly gave two types of reasons for not engaging in peer discussions—social and personal reasons—that form the two global themes. Social factors accounted for 62.2% of the total codes made in this stage and comprised two organising themes and 17 basic themes. Personal factors accounted for 37.8% of the total codes made in this stage, with three global themes and 11 basic themes. Tables 5 and 6 present the organising and basic themes associated with the two respective global themes.

Table 5. Social factors for not collaborating

Organising theme	Code count	Count (in %)	Basic theme	Code count	Count (in %)
Difficulty finding discussion peers	134	90.0	I did not have anyone with whom to discuss.	80	53.6
			I was not familiar with peers from the course.	19	12.7
			It was difficult to arrange meetings with friends as we had different schedules.	13	8.7
			It was difficult to make friends in the course.	7	4.7
			I could not find the opportunity to discuss.	4	2.7
			It was not convenient to discuss.	4	2.7
			I did the quizzes last minute, so I did not have time to discuss.	3	2.0
			I was too shy/introverted to make friends in the course.	2	1.3
			I did not want to bother my friends.	2	1.3
Fairness, pressure, and competition	15	10.1	I did not know we could discuss.	4	6.7
			My peers may not be comfortable discussing since we were competing against one another.	2	1.3
			I did not want to mislead others.	2	1.3
			Grades were supposed to reflect the extent to which students have understood the materials.	2	1.3
			It's not fair to discuss.	2	1.3
			The heavy weightage of the quizzes made it too competitive for discussions to take place.	1	0.7
			My peers were not forthcoming with their responses.	1	0.7
			I did not want to come off as a 'leech.'	1	0.7
Global total	149	100.0		149	100.0

Table 6. Personal factors for not collaborating

Organising theme	Code count	Count (in %)	Basic theme	Code count	Count (in %)
Learning preferences	18	18.7	I preferred to work/learn on my own.	15	18.3
			I did not want to socialize.	3	3.7
Discussing were a low priority	58	74.7	Discussions were confusing/misleading or made me doubt my answers.	13	15.9
			I did not see the need for discussion or find it useful.	18	22.0
			I did not have/make time for discussion.	12	14.6
			I did not find discussions useful.	8	9.8
			I was confident of my answers.	4	4.9
			It was difficult to keep up with discussions.	2	2.4

			The MCQ format (close-ended) rendered discussions meaningless.	1	1.2
Lack of motivation	6	6.6	I lacked the interest in the subject.	3	3.7
			I was too lazy to discuss with others.	3	3.7
Global total	82	100.0		82	100.0

DISCUSSION

The course design promoted critical thinking

The main goal of this study is to investigate the extent to which scenario-based MCQs with informal peer discussions promoted the development of critical thinking skills in students enrolled in a large-cohort introductory humanities course. Both students' self-reported behaviours during peer discussions and their perceptions of the course design suggest that scenario-based MCQs with informal peer discussions promoted aspects of critical thinking, including the ability to explain, interpret, and employ different perspectives for decision-making.

The above outcome is also implied by our deductive analysis of students' self-reported behaviours using Wiggins and McTighe's (2005) six facets of understanding. Many collaborators also left such statements as peer discussions encouraged me to articulate my reasoning for my answers (i.e., explanation), peer discussions allowed me to clarify my doubts or expose any misunderstandings or flawed reasoning (i.e., interpretation), and peer discussions exposed me to different perspectives (i.e., perspectives). These statements had the highest numbers of code counts among all the statements made by collaborators.

Meanwhile, only a small number of students' self-reported behaviours suggest having the need to exercise skills related to application, empathy, and self-knowledge when discussing the quizzes with their peers. Collaborators' perceptions further corroborate this inference: only a few students commented that the MCQs required students to apply concepts to different scenarios; even fewer commented that some of our peer discussions involved differences in philosophical intuitions, and that the MCQs trained me to not allow emotional investment in characters or personal beliefs to interfere with strict logical thinking.

The fact that most collaborators did not mention skills related to applying concepts to different scenarios might seem surprising. As stated in the Introduction and Methods sections, all MCQs used in the course were designed to be scenario-based, requiring students to critically apply concepts learned in the course to specific situations to identify the correct answers. An examination of the MCQs used will reveal that the course design does engage students' ability to critically apply concepts to novel, realistic situations (see supplementary material 1). The need for students to apply concepts sets the context and manifests itself in how knowledge gained from explaining, interpreting, self-reflecting, and considering diverse perspectives works in the foreground. We would thus have expected students to bring up this point more frequently in their comments about the course design.

But there are several points to keep in mind. First, the findings reflect the reported situation during informal peer discussions, and at best indicates that there was indeed little use of skills relating to application, empathy, and self-knowledge in the peer discussions. Second, the awareness among students that application of concepts is happening, is relatively insignificant compared to the awareness that they had to be explaining or justifying their answer options to their peers, that they could be interpreting the questions inaccurately, and that their peers could provide a different, perhaps better,

perspective than their own. In short, these more salient features of peer discussions competed for collaborators' attention over less overt requirements of the quizzes. Finally, to recall a point from Wiggins and McTighe mentioned in the Introduction, the student does not need to be able to describe an element of critical thinking before they are able to apply it.

Nonetheless, some students did comment on how the MCQs required application of concepts to different scenarios:

> *...the open-book [quizzes] shifted the focus from regurgitating content to actually internalising it and focusing on how to apply it to the different scenarios presented. During discussion[s], we were equipped with the required content knowledge from lectures and readings and could discuss more in-depth regarding our different interpretations of the question[s] and philosophical theories, and this allowed us to hear out different perspectives and come to a more well-rounded understanding of the question and content learnt in class.*

The specificity and intensity of the following comments on empathy and self-knowledge aspects of critical thinking also indicated the potential of the course design in promoting these areas of critical thinking:

> *Beyond improving my understanding of and engagement with the class content, the peer discussions increased my appreciation of philosophical reflection. In our weekly discussions, we'd often realize that the positions we were pushing for were informed by deep-seated personal beliefs, which we would then try to dislodge and examine. As a result, our discussions often spiralled way outside of the topic of that week's lessons, but in the process, we'd learn a lot about ourselves and each other, and about critical reflection.* (emphasis added)

> *During group discussions, rarely were we all on the same page when answering harder questions, and curiously, everyone's idea of the correct answer seems justifiable, one way or another. There are some subjective nuances that express each person's priority and preferences [...] but ironically without putting these aside, it was hard and often an arduous journey before we could come to a consensus (if at all) [...] The open-book nature was not as helpful as most thought; when I was confused, turning to the notes did little to resolve my doubts. What was more crucial was whether I had internalized the 'intended' perspective of the topic and if I could apply strict logical approaches, which I found hard to do while emotionally invested in each scenario. Regardless, the module was enjoyable and had a lot of takeaways that everyone (yes everyone under the sun) should be imparted and well-versed with for the better of society.* (emphasis added)

Both comments suggested that the informal peer discussions had revealed how one's personal values motivated one's answer options for the MCQs, demonstrating that the course design promoted self-knowledge. They also showed awareness that this held true for their peers as well, demonstrating that the course design helped them to appreciate and empathise how others' personal values motivated the stance they take towards an issue. The internal consistency between these two comments gives us confidence that the course design can similarly promote empathy and reflexivity, which are important components of critical thinking.

The course design increased enjoyment in students' learning process and experience

Study findings also suggested that the course design increased enjoyment of both intellectual and non-intellectual elements of the learning process, as such statements had the second highest numbers of code counts among all the statements made by collaborators. Statements about informal peer discussions suggested that the discussions helped them to become more engaged in the course, to form new friendships, and to create a positive, supportive learning environment. Meanwhile, statements about the nature of the quizzes expressed that the quizzes were fun or enjoyable to do and were intellectually stimulating/enriching. As one student wrote,

> *The open-book quiz discussions made [the course] community lively and increased my interest in the discipline. My tutorial mates would often discuss questions after our philosophy tutorial, allowing me to get to know my peers better and make new friends as well […] I felt [the course] cultivated a positive learning environment because I was able to reach out to fellow course mates and discuss the quiz and philosophy in general. The cohesive storyline shared among the quizzes was also interesting and it managed to build some sort of 'gated community' with its own inside jokes, quirks that we find among the 10 quizzes. I think this 'exclusiveness' is something that is hard to reciprocate in other modules and this module created a collaborative learning environment, which was a refreshing experience.*

Another student wrote,

> *It is very helpful when one has friends in the module— it allows you to discuss and really share openly about your thoughts […] Due to our friendship, we were comfortable and willing to meet after classes, have a meal, and talk over the quiz. We thoroughly enjoyed the discussions as it stimulated our thought processes a lot, we were almost excited about the release of a new quiz every Friday (as well as checking in on the results after). In summary, it was one of those experiences that I thoroughly enjoyed.*

Traditionally, students identified doing MCQs as a mundane task that tested only content recall. Our study reveals not only that MCQs can be put to good use in the humanities, but also that MCQs can be crafted to grip students' interest and enrich their intellectual capacities. Student responses also revealed that participating in informal peer discussions to work through scenario-based MCQs in groups reinforced a positive experience in the social and affective domains as well. More specifically, peer discussions appealed to the students' intrinsic social nature and served as a force that motivated them to engage in the course materials. Of course, a supportive and collaborative culture needs to be cultivated for these benefits to emerge.

Perceived challenges to student learning experience in the course

A minority of collaborators (12.8%) expressed two concerns about the course design that affected their learning experience. The more popular amongst these was that peer discussions were not useful to their learning: the discussions made them more confused, resulted in self-doubt, or did not help them score better. In one instance, the student reported that the discussion was so confusing, they lost interest in the subject.

Some amount of confusion should be expected in new, challenging situations. Our goal—and indeed, the goal of higher education—is to develop independent and resilient learners who are capable of sifting through and resolving complexities. Peer discussions should be seen as an opportunity for students to build their ability to learn in a self-regulated manner. Nevertheless, our results suggest that some students could benefit from more support in the context of peer discussions, which is something that we could, or should, potentially provide. For example, scaffolding questions to help guide students through areas of confusion commonly encountered in a peer discussion setting could be useful for helping students become independent, complex problem-solvers.

The second concern had to do with unfairness arising from participating in peer discussions. Specifically, the non-interventionist style of informal peer discussions implies that there can be inequitable division of resources: Peers become acquainted due to chance and work together due to various self-selection processes that reinforce and perpetuate existing inequalities. Moreover, some students engaged in expedient strategies such as free riding and sabotaging others in order to be ahead of the class under this unregulated environment.

The essential role of informal peer discussions for learning and performance in this course—as evidenced by reports that the difficult or tricky nature of MCQs incentivised peer discussions, that peer discussions helped with or were crucial for solving the MCQs, and that peer discussions helped me/my peers score better for the MCQs, and by the large proportion of students who decided to engage in informal peer discussions for the course—further exacerbates the severity of unfairness and foul play occurring in the midst of informal peer discussions.

In recent iterations of the course, several measures were introduced to mitigate these challenges. First, a consistent messaging to students reminding them to go into discussions with a collaborative spirit and avoid unhealthy competition, while sharing with them students' comments on how their peers benefitted from collaboration in subsequent classes. Second, ensuring that students have at least one group of natural peers, i.e., their tutorial classmates to discuss with if no others are available by administering MCQs during the week when the topic is discussed in the tutorials. Third, providing opportunities for the tutorial classmates to collaborate together to draft a "discussion summary" on the reading before each topic's lecture (i.e., in the week before the tutorial and quiz for the topic). Students are also reallocated into small discussion groups of five, ensuring that even students in their first year and without pre-existing ties have at least one group with whom they can discuss.

Beyond the formal course structure itself, there has also been a student-led initiative by the senior students in the philosophy student club to host tea sessions and "peer tutoring" clinics to help connect students with one another and create positive interpersonal relationships in groups. They did so as they came to recognize that some juniors did not engage in discussions because they were unable to find peers (see table 5). These efforts have also attracted financial support from the department.

CONCLUSION

This study investigated the extent to which a course design employing scenario-based MCQs and informal peer discussions promoted the development of critical thinking in students enrolled in a large-cohort introductory humanities course. Study findings demonstrated that the course design strongly promoted aspects of critical thinking involving explaining, interpreting and perspective-taking abilities. Moreover, the course design's potential to develop critical thinking skills involving empathy and self-knowledge was also evident. Additionally, students suggested that although peer discussions

made the overall experience in the course more enjoyable, captured students' interest, and enriched their intellectual capacities, they also gave rise to issues such as unfairness and confusion over course content. Instructors and instructional designers keen on employing similar course design in the context of higher education may consider these strategies to strike a balance between providing a space for adult learners to mature as autonomous, self-regulated problem-solvers and a space that ensures fair opportunities.

Kiruthika Ragupathi is an Associate Director at the Centre for Development of Teaching and Learning, National University of Singapore (SGP). Her research work focuses on academic development, assessment, interdisciplinary education, student living-learning experiences, and technology-enhanced learning.

Zi Hui Yeo obtained her bachelor's degree from the Faculty of Arts and Social Sciences, National University of Singapore. She is currently a research assistant at Centre for English Language Communication, National University of Singapore (SGP).

Hui Chieh Loy is an Associate Professor at the Department of Philosophy and the Vice Dean of External Relations and Student Life at the Faculty of Arts and Social Sciences, National University of Singapore (SGP). His primary interest centers around Early Chinese Philosophy, and other interests include Ancient Greek Philosophy, Early Modern and Contemporary Ethics and Political Philosophy. He is currently on the editorial board for Chinese Comparative Philosophy for Philosophy Compass.

REFERENCES

Attride-Stirling, Jennifer. 2001. "Thematic Networks: An Analytic Tool for Qualitative Research." *Qualitative Research* 1, no. 3: 385–405.

Azer, Samy A. 2003. "Assessment in a Problem-Based Learning Course: Twelve Tips for Constructing Multiple Choice Questions that Test Students' Cognitive Skills." *Biochemistry and Molecular Biology Education* 31, no. 6: 428–34.

Biggs, John. 1996. "Assessing Learning Quality: Reconciling Institutional, Staff and Educational Demands." *Assessment and Evaluation in Higher Education* 21, no. 1: 5–6.

Burbach, Mark E., Gina S. Matkin, and Susan M. Fritz. 2004. "Teaching Critical Thinking in an Introductory Leadership Course Utilizing Active Learning Strategies: A Confirmatory Study." *College Student Journal* 38, no. 3: 482–94.

Butera, Fabrizio, Céline Darnon, and Gabriel Mugny. 2010. "Learning from Conflict." In *Rebels In Groups: Dissent, Deviance, Difference and Defiance* edited by Jolanda Jetten and Matthew J. Hornsey 36–52. Oxford: Oxford University Press.

Calkins, Susanna, Sharisse Grannan, and Jason Siefken. 2020. "Using Peer-Assisted Reflection in Math to Foster Critical Thinking and Communication Skills." *PRIMUS* 30, no. 4: 475–99. https://doi.org/10.1080/10511970.2019.1608608.

Casner-Lotto, Jill, and Mary Wright Benner. 2006. "Are They Really Ready to Work? Employers' Perspectives on the Basic Knowledge and Applied Skills of New Entrants to the 21st Century US Workforce." *Partnership For 21st Century Skills*., Washington, DC.

Chi, Michelene T.H., Stephanie A. Siler, Heisawn Jeong, Takashi Yamauchi, and Robert G. Hausmann. 2001. "Learning from Human Tutoring." *Cognitive Science* 25, no. 4: 471–533.

Eddy, Sarah L., Sara E. Brownell, Phonraphee Thummaphan, Ming-Chih Lan, and Mary Pat Wenderoth. 2015. "Caution, Student Experience May Vary: Social Identities Impact a Student's Experience in Peer Discussions." edited by Jeff Schinske. *CBE—Life Sciences Education* 14 (4): 45. https://doi.org/10.1187/cbe.15-05-0108.

Falchikov, Nancy. 2003. "Involving Students in Assessment." *Psychology Learning and Teaching* 3, no. 2: 102–8

Felten, Peter. 2013. "Principles of Good Practice in SoTL." *Teaching & Learning Inquiry,* 1: 121–25. https://doi.org/10.20343/teachlearninqu.1.1.121.

Freeman, Scott, Sarah L. Eddy, Miles McDonough, Michelle K. Smith, Nnadozie Okoroafor, Hannah Jordt, and Mary Pat Wenderoth. 2014. "Active Learning Increases Student Performance in Science, Engineering, and Mathematics." *Proceedings of the National Academy of Sciences* 111, no. 23: 8410–15.

Gillies, Robyn M. 2015. "Academic Talk in the Collaborative Classroom." In *Collaborative Learning: Developments in Research and Practice* edited by Robyn. M. Gillies, 141–56. New York: Nova Science.

Goodwin, Dawn, and Laura Machin. 2016. "How We Tackled the Problem of Assessing Humanities, Social and Behavioural Sciences on Medical Education." *Medical Teacher* 38, no. 2: 137–40.
Hansen, Edmund J. 2011. *Idea-Based Learning: A Course Design Process to Promote Conceptual Understanding*. Sterling, Va.: Stylus.
Howe, Christine. 2015. "Dialogue and Knowledge Transformation: Towards a Socio-Cultural Theory of Cognitive Growth." Paper presented at *EARLI conference*, Limassol, Cyprus, 3–5 August.
Hornsby, David J., and Osman, Ruksana. 2014. "Massification in Higher Education: Large Classes and Student Learning." *Higher Education* 67, no. 6, 711–19. https://doi.org/10.1007/s10734-014-9733-1.
Le, Ha, Jeroen Janssen, and Theo Wubbels. 2018. "Collaborative Learning Practices: Teacher and Student Perceived Obstacles to Effective Student Collaboration." *Cambridge Journal of Education* 48, no. 1: 103–22. https://doi.org/10.1080/0305764X.2016.1259389.
Moeen-uz-Zafar Khan, Badr Muhammad Aljarallah. 2011. "Evaluation of Modified Essay Questions (MEQ) and Multiple Choice Questions (MCQ) as a Tool for Assessing the Cognitive Skills of Undergraduate Medical Students." *International Journal Of Health Sciences* 5, no. 1: 39.
Monks, James, and Robert M. Schmidt. 2011. "The Impact of Class Size on Outcomes in Higher Education." *The BE Journal of Economic Analysis and Policy* 11, no. 1.
Neumann, Ruth, Sharon Parry, and Tony Becher. 2002. "Teaching and Learning in Their Disciplinary Contexts: A Conceptual Analysis." *Studies in Higher Education*, 27 no. 4: 405–17.
Nicholas, Mark C., and Chalmer E. Labig Jr. 2013. "Faculty Approaches to Assessing Critical Thinking in the Humanities and the Natural and Social Sciences: Implications for General Education." *The Journal of General Education* 62, no. 4: 297–319.
Niu, Lian, Linda S. Behar-Horenstein, and Cyndi W. Garvan. 2013. "Do Instructional Interventions Influence College Students' Critical Thinking Skills? A Meta-Analysis." *Educational Research Review* 9: 114–28.
Roscoe, Rod D. 2014. "Self-Monitoring and Knowledge Building in Learning by Teaching." *Instructional Science* 42, 327–51.
Scouller, Karen. 1998. "The Influence of Assessment Method on Students' Learning Approaches: Multiple Choice Question Examination Versus Assignment Essay." *Higher Education* 35, no. 4: 453–72.
Scriven, Michael. and Richard Paul. 1987. *Defining Critical Thinking*. 8th Annual International Conference on Critical Thinking and Education Reform.
http://www.criticalthinking.org/pages/defining-critical-thinking/766.
Topping, Keith, Céline Buchs, David Duran, and Hilde van Keer. 2017. *Effective Peer Learning: From Principles to Practical Implementation*. Routledge, Taylor & Francis Group.
Tight, Malcolm. 2019. "Mass Higher Education And Massification." *Higher Education Policy* 32, no. 1: 93–108.
Trow, Martin. 1999. "From Mass Higher Education to Universal Access: The American Advantage." *Minerva*: 303–28.
Vygotsky, Lev S. 1978. *Mind In Society: The Development of Higher Psychological Processes*. Cambridge: Harvard University Press.
Webb, Noreen M., Jonathan D. Troper, and Randy Fall. 1995. Constructive Activity and Learning in Collaborative Small Groups. *Journal of Educational Psychology*, 87, 406–23.
Wiggins, Grant, and Jay McTighe. 2005. *Understanding by Design*. ASCD.

SUPPLEMENTARY MATERIALS

Supplementary material 1: Sample scenario-based MCQ

Background:
Students were introduced to the free will debate via Galen Strawson's New York Times article, "Your Move: The Maze of Free Will" (22 July 2010) and a lecture discussing the arguments and concepts in the week before the quiz.

MCQ:
Lena and Dave spent the morning studying together in the library. While they were packing up to leave, Dave swung his bag, which pushed Lena's new phone off the table. The phone landed heavily on the ground and its screen cracked. "It was an accident!" He exclaimed. "You broke the screen of my new phone! You should cover the repair costs!" said Lena. In reply, Dave said: "It's not my fault because it was an accident. I'm not paying for the repair!"
Lena and Dave were still arguing over lunch, where they met Will and Gene. They asked Will and Gene to adjudicate. Will and Gene made the following comments:

Will: "If Dave is a morally responsible creature, then Dave definitely deserves to be thought badly of or punished for breaking the screen of Lena's phone."
Gene: "If Dave is not morally responsible for his actions, then there is no reason for Dave to pay for the repair of Lena's phone."

Based on the concepts taught in the lecture on moral responsibility, who is correct?
A. Will.
B. Gene.
C. Both Will and Gene.
D. Neither Will nor Gene.

Question debrief on the course blog upon conclusion of the quiz:
Option D ("Neither Will nor Gene"), and most of you (84.0%) got this.
Will is incorrect because even if Dave is a *morally responsible creature*, it doesn't follow that he is morally responsible for everything he does or happens in his vicinity. There could be other conditions that weren't fulfilled. For instance, suppose you think that something like the Naïve Theory [a foil introduced in the lecture] is true, then (conceivably) Dave would deserve blame if he broke Lena's phone because he chose to do so (and the act of breaking Lena's phone screen is wrong). But what if he did it *accidentally* and so didn't "choose to do so"? In that case, the Naïve Theory won't imply that he is morally responsible for breaking the phone. After all, even morally responsible creatures can do things accidentally sometimes.

Gene is incorrect because there might be other reasons for Dave to pay for Lena's phone that have nothing to do with whether Dave deserved to be blamed, or thought he deserved to be blamed. For instance, he might agree to pay to preserve his friendship with Lena, or to escape other people's untoward attention, or to look good in front of other onlookers, etc. Keep in mind the connection made being morally responsible and deserving to be blamed in the lecture.

(see course blog for more examples).

Supplementary material 2: Survey questionnaire

Instructions

You are invited to this study, as you are a student/ex-student of the course XXXX. This study is aimed at understanding how peer interactions make a difference to quiz and module performance. The study findings will be used in future offerings of the module.

This survey seeks to collect data regarding how you did the weekly MCQs. There are 10 questions in all (including one free form essay). Estimated time to complete: 10 minutes.
We require your matriculation number purely to verify that you are indeed a student who took this course, and to facilitate the correlation study. But otherwise, everything collected will be kept in confidence and the merged data will be de-identified.

Consent

I have read the instructions. I agree to participate in this study.

Questions

1. Student ID (to confirm that you took the course)

2. In total (including discussions), up to how many hours, did you spend on average, doing the weekly MCQ?

- Less than 1 hour
- 1–2 hours
- 2–3 hours
- 3–4 hours
- More than 4 hours

3. When doing the weekly MCQs for XXXX, did you make it a point to discuss the questions with peers? [YES/NO] [If the answer is "NO," the survey branches to Q12]

4. Indicate the number of hours that you spent on the following activities to complete the following activities?

- Discuss with others
- Review the lectures
- Read the course blog
- Review the readings
- Look for additional readings (not assigned by the tutors)
- Consult with tutors/professors
- Search online
- Any other

5. Which of these activities was important for your own learning (pick top three)?

- Discuss with others
- Review the lectures
- Read the course blog
- Review the readings
- Look for additional readings (not assigned by the tutors)
- Consult with tutors/professors

Search online
Any other

6. Up to how many people do you discuss the quiz with (on average)?

7. With whom do you spend significant time discussing the quiz? Select all that applies.
Tutorial mates
Other classmates in the module who are not in my tutorial group
Other schoolmates who are not in the module
Fellow residents from my Hall/Residential College
Others

8. How do you discuss the quizzes? Select all that applies.
In-person
Using social media/chat/texting
On-the-phone
Others

9. Rate your agreement with the following sentences. (5=strongly agree; 3=neutral; 1=strongly disagree)
Discussing the quizzes enhanced my learning of the subject.
Discussing the quizzes enabled me to score better.
Discussing the quizzes increased my engagement with the subject.
Discussing the quizzes enhanced my enjoyment of the module.
Discussing the quizzes is a way to challenge my own ideas and beliefs in order to arrive at a more complete understanding.
Discussing the quizzes is a way to develop my own thinking by using the ideas of others.
Discussing the quizzes is a way to collect new ideas.
Discussing the quizzes is a way to check if my ideas are right, and I am learning the right things.
I am open to the perspectives of my peers during the discussions.
We arrive at a shared understanding at the end of our discussions before taking the quiz.

10. Please elaborate on your impressions about the open-book quiz format with peer discussions and its impact on your learning, including positive elements, concerns, ambivalences, etc. Please provide examples of your experience, if possible, on what you did to engage or not engage in the discussions.

11. I would like to take part in a focus group interview [YES/NO]

12. Is there a reason as to why you did not engage in discussions? Please elaborate.