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Student-generated discussion questions: Production and engagement

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1. Introduction

Thought-provoking questions are the foundation of meaningful classroom discussions, yet it can be difficult to predict what questions will lead to fruitful directions. Superficial questions are unable to engender sufficient depth of inquiry. On the other hand, too-ambitious questions may lead students to abandon the challenge prematurely, similarly rendering a discussion that fails to develop significantly. Student-generated questions can give students "ownership" of their learning, allowing them to fashion a discussion that reflects the issues which strike them as they process new information and ideas, and subsequent reflection on the questions and the ensuing discussion may enable them to become more refined questioners.

Such a practice can be particularly effective in CLIL courses, which often utilize authentic materials. This study reports on the student-generated discussion questions of two advanced-level Media English university courses, analyzing the types of questions the students produced as well as their later considerations on which questions engendered the most rewarding discussions.

2. Issues in student-generated questions

2.1 Discussion question classification

Discussion questions may be categorized in a variety of ways. The classifications of many researchers are informed by Bloom's (1956) taxonomy of educational objectives, which posits a hierarchy moving from the lowest level of knowledge to comprehension, application, analysis, synthesis, and finally evaluation at the highest level. While such classification focuses on the cognitive complexity of the question itself, Guilford (1958) draws attention to the expected outcome of questions, making a distinction between convergent and divergent thinking. In discussion questions that make use of convergent thinking, there is an expected answer, and the discussion of the question ends when that answer is obtained. In contrast, questions built on divergent thinking anticipate a range of possible answers (Guilford, 1958). A question that is high in Bloom's hierarchy constructed in a convergent mode may render less expansion and development than anticipated (Andrews, 1980).

Building on Bloom (1956) and Guilford (1958), Andrews (1980) created a classification system of 11 types of discussion questions, divided into those requiring higher-level divergent thinking and those demanding only lower-level convergent thinking. Higher-level divergent questions included "playground" questions in which the question specified the area of inquiry but left the specific "game" up to the respondents; "brainstorm" questions; "focal" questions, in which some alternative responses are provided, and respondents must take a stand and justify their decision; and "general invitation" questions.

Bradley et al. (2008) adapted Andrews (1980) questions, dividing the "playground" type into two: "direct link" questions, which related to a specific part of an article, such as a quotation from it, and "course link" questions, which coupled information from the course generally to the assigned article. Bradley et al. (2008) further divided Andrews' (1980) "focal" question into "limited focal" with up to a maximum of four alternatives provided, and "open

focal," in which no alternatives are provided.

Other researchers have opted for less intricate classifications. In analyzing the questions created by elementary school children, Scardamalia and Bereiter (1992) divide them into "basic information questions" and "wonderment" questions that demonstrate a desire to delve further into the topic under discussion. Similarly, in their assessment of written questions chemistry students submitted as part of their grade for a university-level course, De Jesus et al. (2003) made a simple dissection into two types: "confirmation questions" that clarify information, ask for examples, etc., and "transformation questions" that adjust students' thinking, for example, challenging accepted notions.

Pushing back against the ranking of questions and emphasizing that both confirmation and transformation questions have value, the researchers argue:

> *"A key difficulty with 'levels' such as these is that they are unipolar and value directional: asking higher level questions is clearly better (superior) that asking low-level ones. What this kind of taxonomy does not allow for, however, are notions of context, situation, task, preference, intention, strategy, or goal"* (De Jesus et al., 2003, p. 1028).

Employing a metaphor of panning for gold, De Jesus et al. (2003) suggest that finding the transformational "gold" requires sifting through "sand", and that confirmation questions may serve an important role either prior to or following transformational ones.

2.2 Assessing responses to questions

Quantity evaluations

One common type of assessment of responses to discussion questions involves tallying the number of words, statements, or posts generated as a result, or "discussion mileage" Andrews (1980). In analyzing discussions among university students based on the number of student statements (NSS)

following a question, Andrews (1980) found that higher-level structured questions yielded the highest NSS. Non-structured, overly broad "general invitation" questions produced roughly half the number of NSS of the higher-level structure questions, but nevertheless produced more NSS than lower-level convergent questions that targeted memory or comprehension.

Ertmer et al. (2011), using Andrews' (1980) taxonomy in analyzing the responses of undergraduate and graduate students to asynchronous discussion questions, similarly found that structured higher-level divergent questions led to the highest number of posts. In their investigation of online discussion responses among undergraduates, Bradley et al. (2008) also found that "limited focal" and "direct link" questions generated the most words, followed by "brainstorm" and "open focal".

Quality evaluations

Making use of Bloom's taxonomy, Ertmer et al. (2011) found that higher-level questions led to a greater percentage of higher-level responses. Nevertheless, no high-level questions resulted in more than half of the responses being coded as high-level, and even high-level questions produced low-level comprehension responses in 33% of the cases. Of 816 coded responses to 18 question prompts, only 6% were classified as high level, with 47% classified as low level and an additional 47% as medium level (Ertmer et al., 2011). Bradley et al. (2008) similarly found that "course link", "brainstorm", and "direct link" questions resulted in higher-level thinking in the responses.

3. The study

The study set out to examine the following research questions:

1. What kind of discussion questions do students create related to specified content?
2. How do students evaluate discussion questions in terms of engagement post-discussion?
3. What reasons do students express for questions that provoked deep

engagement?

The research was undertaken on two courses of an advanced-level elective for students in their second year of university and above, titled Media English. A1 had 10 students and A2 had 18 students. Each week for a total of 13 weeks, students were assigned homework to listen to roughly 15 minutes of a podcast related to business, and to submit their listening notes, a one-sentence summary of the main point of the podcast section, and two discussion questions. Table 1 shows the lists of podcasts assigned.

During class, the students were put into groups of 4-5 people, and they used the questions as the basis for their discussions. After each class, students were assigned homework to reflect on which question provoked the deepest engagement among all the group members, and what they thought the reason for this particularly active participation was.

A total of 209 questions were generated by the A1 class. One student submitted three questions for one assignment, and one question of another student was incomprehensible and not included in the data, making a total of 208 questions. 380 questions were generated by A2. Two were discarded as incomprehensible, making the total 378.

A1 students mentioned 78 questions as the one that provoked the deepest engagement. Of these, 11 could be classified as two question types, for a total of 89 questions in the categories. The A2 students mentioned 163 questions. Twenty-five could be classified as two question types, for a total 188 questions in the categories.

A1 students mentioned 81 reasons for the active participation provoked by the chosen question. Five students gave two reasons for a given question. 177 reasons were mentioned by the A2 students. Fifteen students provided two reasons for a given question. Table 2 shows the breakdown.

The questions the students created were classified into the following eight categories:

Table 1. Weekly podcasts

Class	Topic	Podcast title	Episode title
2	Left-digit bias	Freakonomics, M.D.	What Do Grocery Store Prices and Heart Surgery Have in Common?
3	Aspirational consumption	No Stupid Questions	Why Do We Buy Things We'll Never Use?
4	Venture capital	Freakonomics Radio	Is Venture Capital the Secret Sauce of the American Economy?
5	Stradivarius	Planet Money	Is a Stradivarius Just a Violin?
6	Airport business	Business Casual	The Business Behind Airports and What It's Like to Live in One
7	Barriers to women in high positions	HBR IdeaCast	Why the Highest Paying Jobs So Rarely Go to Women
8	Reimagined customer	Built for Change	Getting to Know the "Re-imagined" Consumer
9	Airbnb	Masters of Scale	Airbnb's Brian Chesky in Handcrafted
10	Driverless vehicles	People I Mostly Admire	Aicha Evans Wants You to Take Your Eyes Off the Road
11	Tate's Bake Shop	How I Built This	Tate's Bake Shop: Kathleen King
12	Greedy work	Vox Conversations	Life as Identity, Burnout as Lifestyle
13	Cinepolis	Harvard Alumni Entrepreneurs Invites	Building a Cinema Empire: How Mexico's Cinepolis Conquered the World
14	Consumerism and pastors	Solvable	Consumerism and Celebrity Culture in Faith Organizations are Solvable

Table 2. Student data

	Questions generated	Questions evaluated	Evaluation reasons
A1	208	89	81
A2	378	188	177
Total	586	277	258

- *Reflection:* ex., "What did you learn from...?"
- *Assessment:* ex., "What do you think about..."
- *Application:* ex., "How does... apply to...?"
- *Information-seeking:* ex., "What do you know about...?"
- *Experience:* ex., "Have you ever...?"
- *Analysis:* ex., "What are the factors in...?"
- *Prediction:* ex., "What will happen...?"
- *Problem-solving:* ex., "How can we solve...?"

The reasons the students gave for the questions they deemed most engaging in the discussion were similarly classified into six categories as follows:

- *Discovery*
- *Different opinions*
- *Familiar*
- *Useful/essential*
- *Interesting examples, opinions, ideas*
- *Difficult content*

4. Findings

4.1 Generated questions

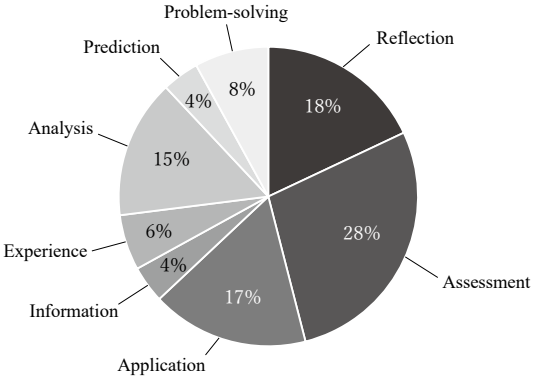
For the A1 data, 20 questions were classified as two question types, bringing the total number to 228. Similarly, in the A2 data, 67 questions were classified as two types, for a total of 445. Table 3 shows the breakdown of the types of questions generated by the students in each class.

There were some differences between the frequency of question types generated. While assessment questions were most common in both classes, with 28% of all questions generated comprising this type, the A1 students showed a similar proclivity for reflection question, which also comprised 28% of the questions they produced. However, the frequency of this type of ques-

Table 3. Generated question types

	A1 Generated	%	A2 Generated	%	Combined generated	%
Reflection	64	28%	60	14%	124	18%
Assessment	63	28%	125	28%	188	28%
Application	24	10%	89	20%	113	17%
Information	20	9%	9	2%	29	4%
Experience	18	8%	23	5%	41	6%
Analysis	18	8%	81	18%	99	15%
Prediction	14	6%	13	3%	27	4%
Problem-solving	7	3%	45	10%	52	8%
Total	228	100%	445	100%	673	100%

Graph 1. Combined generated question types (%)



tion among the A2 students was only 14%. On the other hand, 20% of the A2 questions were application questions but only 10% of the A1 questions were this type. The A2 students also were more likely to produce analysis and problem-solving questions than their A1 counterparts, with a frequency difference of 10% and 7% respectively. Graph 1 shows a pie chart of combined

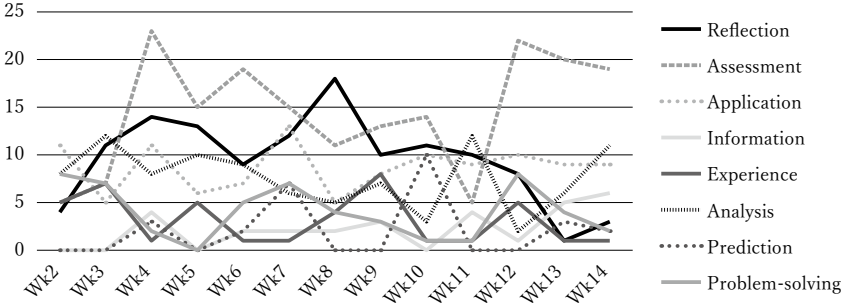
frequencies.

There was considerable variation in the question types generated depending on the week, particularly regarding assessment and reflection questions. Assessment questions peaked in week 4, which focused on venture capital, and week 12, which dealt with "greedy work". Conversely, assessment questions were lowest in week 2 (left-digit bias), week 3 (aspirational consumption), and week 11 (Tate's Bake Shop). On the other hand, reflection questions hit their highest in week 8 (the "reimagined" consumer) and were lowest in week 4 (venture capital), week 13 (Cinepolis), and week 14 (consumerism and pastors).

Likewise, the prevalences of other question types varied from week to week, albeit on a lesser degree of divergence. Analysis questions peaked in week 3 (aspirational consumption), week 11 (Tate's Bake Shop), and week 14 (consumerism and pastors), but were lowest in week 10 (driverless vehicles) and week 12 ("greedy work"). Application questions were highest in week 7 (barriers to women) and lowest in week 3 (venture capital) and week 8 (the "reimagined" customer). While prediction questions were generally low, they peaked in week 10 (driverless vehicles) and week 7 (barriers to women).

Focusing on the topics, students were likely to create assessment questions related to venture capital but not reflection or application. Similarly, the

Graph 2. Generated question types according to week



topic of “greedy work” produced assessment questions while yielding relatively few reflection questions. Meanwhile, the podcasts related to aspiration consumption, Tate’s Bake Shop, and consumerism and pastors tend to generate a relatively high frequency of analysis questions but not many assessment question types. The topic of driverless vehicles afforded prediction rather than analysis. Graph 2 shows the generated question types according to week.

4.2 Questions provoking engagement in discussion

Out of 208 questions generated by the A1 class, 89 were chosen as provoking the most engagement, and of the 378 questions created by the A2 students, 188 were selected. There was considerable divergence between the classes in the type of questions they deemed as provoking the most engagement in their discussions. Twenty-one percent of the questions chosen by the A1 class were related to reflection, but only 5% of the A2 selected questions were of this type. Conversely, 21% of the questions that the A2 class judged as stimulating the most discussion were problem-solving inquiries, while only 4% of the selected A1 questions were of this category. Similarly, 29% of the A2 highly evaluated questions were questions focused on analysis, more than twice as many as those chosen by A1 (11%).

The most evenly matched question type in terms of the perceived efficacy in producing active discussion was assessment, with 20% of the questions the A1 students chose and 19% those selected by the A2 students falling into this category. Twenty-five percent of the questions selected by the A1 class were application questions, and 15% of the A2 questions were. Overall, the most highly ranked question types among the A1 students were application, reflection, and assessment, while for the A2 students they were analysis, assessment, and problem-solving. The rank for the combined assessments was 1) analysis (23%); 2) assessment (19%); and 3) application (18%). Table 4 shows the detailed breakdown of numbers and percentages, and Graph 3 shows the combined percentages of question types provoking

engagement.

A higher frequency of generation did not guarantee a higher frequency of evaluation in the ensuing discussion. Table 5 shows a comparison of the most generated questions and those most chosen for provoking engagement. Although problem-solving represented only 8% of the generated questions in

Table 4. Engagement question types

	A1 selected	%	A2 selected	%	Combined selected	%
Reflection	19	21%	9	5%	28	10%
Assessment	18	20%	35	19%	53	19%
Application	22	25%	28	15%	50	18%
Information	7	9%	2	1%	9	3%
Experience	5	6%	10	5%	15	6%
Analysis	10	11%	54	29%	64	23%
Prediction	4	4%	10	5%	14	5%
Problem-solving	4	4%	40	21%	44	16%
Total	89	100%	188	100%	277	100%

Graph 3. Combined percentages of question types provoking engagement

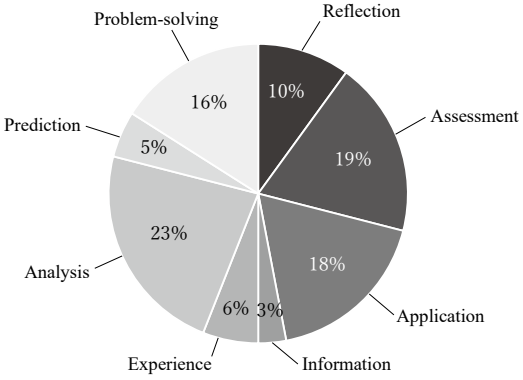


Table 5. Generated and engagement-provoking question types by rank

	Most generated A1	Most engagement A1	Most generated A2	Most engagement A2	Most generated combined	Most engagement combined
1st	Reflection (28%)	Application (25%)	Assessment (28%)	Analysis (29%)	Assessment (28%)	Analysis (23%)
2nd	Assessment (28%)	Reflection (21%)	Application (20%)	Problem-solving (21%)	Reflection (18%)	Assessment (19%)
3rd	Application (10%)	Assessment (20%)	Analysis (18%)	Assessment (19%)	Application (17%)	Application (18%)

the two classes, 21% of questions that were deemed to stimulate engagement were of this type. Analysis questions, too, were evaluated highly relative to their frequency of generation. They comprised 17% of the generated questions, but 23% of engagement questions.

On the other hand, while assessment questions were frequently created, with 28% of the generated questions falling into this category overall, they were less likely to be judged as provoking engagement, amounting to 19% of the questions chosen for their subsequent engagement. Reflection questions, as well, were created by the students more often than they were chosen for engagement, with frequencies of 18% and 10% respectively. Application questions were the most balanced. 17% of the generated questions were related to application, and 18% of the questions evaluated as eliciting engagement were of this type.

4.3 Reasons for engagement in discussion

After choosing the question that had produced the most engagement during the discussion, students then provided a reason for the engagement. For the A1 class, the most common type of reason given was related to a sense of discovery experienced in the discussion, 32% of the reasons comprising this category. However, only 14% of the reasons provided by A2 students

were of this type. The A2 students alluded to the classmates having different opinions most often (33%), while 20% of the A1 students provided this reason. Additionally, 28% of the A2 students indicated that interesting examples, opinions, or ideas were brought up in response to the discussion question, but only 15% of the reasons expressed by the A1 students related to this. Combining the reasons given by both classes, the most common reasons for believing a given question provoked engagement in the subsequent discussion were different opinions, encompassing 29% of all reasons given, interesting examples, opinions, or ideas (24%), and discovery (20%). Table 6 shows the breakdown and numbers of percentages for the reasons, and Graph 4 shows a pie chart of the combined reasons for engagement.

Roughly half of the students had clear tendencies in what they valued in a discussion. For example, 90% of Student 9's reasons for a given question resulting in the deepest engagement in the discussion were related to a sense of discovery, and 80% of the reasons Student 17 provided dealt with the sharing of different opinions. Overall, 21% (six students) showed a general inclination for questions that resulted in different opinions among the classmates, and roughly 11% focused on discussions in which interesting examples, opinions, and ideas were produced in response to the question.

Table 6. Reasons for engagement

	A1	A2	Combined
Discovery	26 (32%)	26 (14%)	52 (20%)
Different opinions	16 (20%)	58 (33%)	74 (29%)
Familiar	12 (15%)	19 (11%)	31 (12%)
Useful/essential	12 (15%)	16 (9%)	26 (10%)
Interesting examples, opinions, ideas	12 (15%)	49 (28%)	61 (24%)
Difficult content	3 (3%)	9 (5%)	12 (5%)
Total	81 (100%)	177 (100%)	258 (100%)

Graph 4. Combined engagement reasons

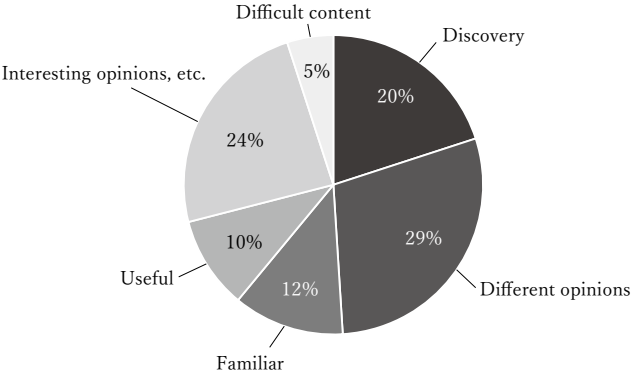


Table 7. Breakdown of students with clear preferences for specific engagement types

Student	Reason type	Frequency
1	Familiar	40%
2	Useful	75%
4	Useful	66%
7	Discovery	66%
9	Discovery	90%
12	Familiar	66%
13	Different opinions	55%
14	Interesting examples, opinions, ideas	40%
17	Different opinions	80%
18	Different opinions	75%
20	Interesting examples, opinions, ideas	45%
22	Different opinions	60%
25	Different opinions	50%
27	Different opinions	75%
28	Interesting examples, opinions, ideas	50%

5. Discussion

A comparison of the types of questions students generated in preparation for a discussion with the types of questions that they later evaluated as provoking engagement as well as what they perceived as engendering such engrossment makes clear several aspects of the interplay between discussion questions and discussions. These include the influence of topic on the questions generated; the potential discrepancy between produced questions and highly evaluated questions; as well as the types of communicative experiences that students themselves find key in unlocking interest and involvement in discussions both for themselves and for the other discussion participants.

The podcast sections the students were assigned to listen to and create discussion questions about had a distinct influence on the types of questions they generated. It is likely that the topics of venture capital and "greedy work" yielded frequent assessment questions because such topics may be seen as inviting a reaction to them, as the podcasts presented payoffs: investing in many businesses but with a likely (huge) return on only 1-2% or having a job that pays very well but demands all of your time. In contrast, the podcasts about aspirational consumption, Tate's Bake Shop, and consumerism and pastors may have produced analytical questions due to a felt need to tease apart the factors related to such expenditures focused on becoming a new and better person, success in an originally small enterprise, or the ethics of religious figures displaying status markers. On the other hand, a topic such as driverless vehicles may be viewed as plainly lending itself to questions focused on prediction.

Nevertheless, questions that most often sprung to mind based on the topics were not always the ones that absorbed the discussion participants the most deeply. Analysis, assessment, and application questions were assessed to lead to the most active discussions. On the other hand, while reflection questions were the second-most generated type overall, comprising 18% of all

questions produced, only 10% of the questions selected as provoking engagement in the ensuing discussions were of this type. In particular, analysis and problem-solving questions were deemed more valuable in terms of engagement relative to the number generated. It is not necessarily more difficult for students to create such questions than other types, but it is possible that in the process of creating questions, students are not fully able to predict which question types are likely to expand and deepen the discussion.

An essential question, of course, is what "engagement" signifies. The length of time that one question is discussed before moving onto another question indicates how long the participants could come up with things to say in relation to it, but beyond such objective measures there is the subjective experience of being engrossed in a discussion, and the students appeared to have no difficulty in identifying what they felt was the key that unlocked this type of communicative event. Three factors appeared to be most salient: 1) classmates having different opinions; 2) sharing interesting examples, opinions, or ideas; and 3) a sense of discovery contribute most to engagement. When such interactions or encounters took place, the discussion ceased to be a routine classroom task and instead grew into a genuine learning experience that the participants recognized as meaningful.

At the same time, it is evident that many students have clear tendencies in evaluating engagement. Fifteen out of 28 students gave the same reason in 40% of more of their assessments. This suggests that they may have a set view of what constitutes a good discussion and seek out that particular aspect. It is also possible that they fell into a routine in their assessments, providing a reason without deep reflection. There were also differences between the two classes. In such small classes, it is likely that a few highly engaged students can set the tone of the discussions, which might account for these divergences.

Students often find it easy to discuss familiar topics, and 12% of the reasons for engagement fell into this category. However, ease of speaking does not always translate into an interesting or deep discussion, as one student

commented about a question generated by the aspirational consumption podcast:

> *This question is easy for members to give many opinions because people often experienced buying things we'll never use. In fact, the discussion time about this question is longer than any other question. But, I have a reflection. It is a ordinary question. So, the quality of discussion is low. I didn't create deep opinions by this question.*

On the other hand, another student, reflecting on the same discussion wrote:

> *Because we talked about what we like and what we like to do (private thing).We could know each other and get closer to each other.*

For this student, the question prompting a discussion of something all students felt familiar with led to a welcome conversancy and affinity in the discussion. The topic of aspirational consumption was covered in the third week of class and was hence the second discussion. It is possible that as the semester progressed this student and others may have made different assessments if they were already sufficiently comfortable with each other. The timing in the semester of each discussion may affect what is valued.

Yet some students also appreciated the level of scrutiny that a question of difficult content elicited. Commenting on an application/analysis question about Airbnb (week 9) that emerged during the discussion, one comment focused on how narrower questions could lead to deeper discussions than broader ones:

> *We came up with a new question that why Chinese Airbnb failed. Because it was so specific that made us easy to do "discussion", not just telling what we thought.*

The category of different opinions was the most common among the reasons for evaluation. In the best case, such exchange of opinions leads not just to an active discussion but also discovery:

> *I couldn't come up with interesting idea, but everyone said their own idea and it swelled my imagination. I think this kind of question leads to exiting discussion and we can make our answer to this question.*

Another student made a similar comment that paired different opinions with discovery:

> *Because it reflects what we value for work. Some people prioritized doing what they want, and other people prioritized safety and stability for the future. I was happy to listen to many opinions. It allowed me to rethink my idea about a job.*

Sometimes, it only took one student's different viewpoint to ignite a discussion:

> *And following opinion is what I found to be the most interesting opinion. He have an image of nobility about the preachers. Hence, he thought, preachers could post about their feathered lives. The members of our group, myself included, all had an image of the clergy as living a strict and unselfish life and were therefore not willing to actively accept the post of expensive sneakers. However, it was interesting to see how different ideas can differ so much if they are based on different assumptions to begin with.*

How a discussion question will be developed in the ensuing discussion is difficult to predict. The students' data indicate that questions with a "good fit" – those which are not too abstruse but also not too simple or general work

well. It is likely that analysis questions, which were the category that was most often tagged as provoking engagement, lend themselves well to this kind of scope adjustment. An easy discussion is not necessarily an interesting one, and the students clearly value peer to peer learning and insight, which takes place when something new or unexpected is expressed.

6. Conclusion

This study set out to investigate the types of discussion questions students generate in advance of discussions, and how those questions are subsequently evaluated post-discussion. It was found that analysis, assessment, and application questions led to the greatest engagement. However, more assessment questions were posed than were selected as provoking engagement. Conversely, fewer analysis questions were created, and yet a higher percentage of those were chosen as efficacious for the discussion. Problem-solving questions are limited to certain topics, but when they are proffered, they similarly can lead to lively discussion. It was also found that students consider "engagement" as more than a discussion that proceeds without too many pauses. They appreciate the opportunity to ponder and encounter new ideas through the collective process of discussion.

Future research could investigate ways to help students come up with questions that provide the seeds for a fruitful discussion. While the practices described in the present study may have implicitly led students to develop their question-producing skills through reflection on which questions worked well, a more explicit emphasis on putting those reflections to work in the following week's question production might be effective, but this remains an area for future exploration.

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