Challenges and potential solutions to introducing group presentations in large class teaching

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Group-based learning is well known to have various beneficial effects to promote active learning and help students gain subject-based and transferrable skills that are likely beneficial for their future. Hence, as part of my Cell Biology Year 2 undergraduate module, I have introduced group-based work, in which students are assigned to teams of three students and then perform various graded and non-graded in-class activities. In semester 2 of Academic Year 2018/19, due to the unexpected inability of one of the lecturers to teach his component, I introduced an additional group-based independent learning element. In this component, the student teams had to prepare and give 4 min presentations related to the topic of the cell cycle and cell proliferation. The student teams also had to come up with two application based multiple choice questions (MCQ) based on their presentation content. These questions were then answered by the rest of the class individually via the IVLE online platform. Question with a lower level of difficulty had to be answered immediately after each presentation, whereas 36 hours of time was given to answer more difficult question out of class at home. The detailed instructions and grading criteria for the assignment are listed in the inset below:

Instructions for the group based presentation assignment:

Instructions for group presentation:

For the cell proliferation/cell cycle component, you would have to give a 4 min presentation on a chosen topic and come up with two MCQ, which will be answered by the whole class after each presentation. The marks for this component will be made up of:

presentation: 4.5% (team marks)

MCQ setting: 2% (team marks)

MCQ answers: 10.5% (individual marks)

Topic: I would like you to choose one specific application question.
The question should start with "Why…?" or "How…?"
I have uploaded a number of examples in this google document:

-Why is knockout of Cdk1 embryonically lethal?

-How does the anti-cancer drug taxol kill tumor cells?

-Why does knockdown of Cdh1 and Cdc20, which are part of the same Anaphase Promoting Complex, have different effects on the cell cycle?

-Why does a mutation in RAS promote tumor formation?

-Why does DNA damage, induced by gamma-irradiation, lead to cell cycle arrest?

If you want you can choose these topics (only one team per topic) by indicating your team number besides the topic, or choose a new topic and submit it into the google document with your team number. Try to choose a topic that is different from those that have already been chosen. I will check the topics a few times daily and approve them if ok. If you really cannot find a topic yourself, you can email me and I will give you one.

It does not matter what sources you use to prepare your presentation (textbook, research papers, or other internet resources). When preparing the presentation, assume that the class has some basic knowledge about DNA and the cell cycle, but otherwise only knows what was taught in my and Dr Sudhakar's lectures (in other words, do not refer to or build on what other teams may present). Do not worry about duplication of content. Every presentation will be evaluated independently based on its own merits. You do not need to send me your slides beforehand, but please upload them onto the desktop in the LT before the lecture.

Who needs to present: This is up to you. You can all share the load or nominate one or two presenters. All team members will obtain the same mark.

Marking: The criteria are 1) What is the scientific quality of the presentation; 2) How clear/easy understandable is the presentation; 3) How interesting is the presentation;
The marks will be made up to equal parts of assessment by myself, by one co-lecturer and by the audience (you).

Instructions for MCQ setting:

Your two MCQ should be based on your presentation. You need to submit them at least 24hours before your presentation slots to me via email. The questions should have at least 3 answer options and can have one or multiple correct answers. **Please indicate the correct answer(s)!** Myself and the co-lecturer will evaluate your MCQ **after** your presentation. The main criterion is whether the question manages to test the student's understanding (understand and apply what you have explained). Questions which only test whether the students remember facts from your presentations will not be ideal. The questions can contain a figure (but this is not a must!).

MCQ answers:

After each presentation, we will give you a chance to cast your vote for the quality of the presentation. We then flash up the 2 MCQ and you can answer them individually via IVLE. We will count your average score of the best 3 out of the 4 sessions/lectures (so you can miss one lecture).

This was a challenging activity, given that group presentations are normally very uncommon in large class teaching during the first two years of University studies. The format of the of the presentations was also different from the common research paper based group presentations in year 3 and year 4 life science modules in terms of

i) the short presentation time of 4min, in order to allow all teams to present;

ii) the fact that the teams had to choose their own topic (to give the student more autonomy with the intention to increase student motivation, development of analytical and decision-making skills)

iii) the requirement for students to design and answer application-based MCQ (with the aim of promoting student learning, student engagement, attention and class attendance)

The main learning objectives of the assignment were:

-learning of cell cycle and cell proliferation-related knowledge and apply learned knowledge

-development of skills to independently acquire knowledge

-learn to productively engage with team members

-develop presentation skills (from presenting and listening to other student group presentations) and experience the challenges of presenting in front of a large audience.

To evaluate the outcome of the intended learning objectives, an anonymous online survey was conducted after the end of the component, which is presented below, along with some reflections by the lecturer. In the survey, students had to rate the level of agreement with the four indicated questions. The students were also able to give examples or comments. However, this was optional. There were 48 student responses out of 127 students taking the module (37.8% response rate).

QUESTION 1. I learned new knowledge while preparing and giving my presentation and setting up the MCQ.
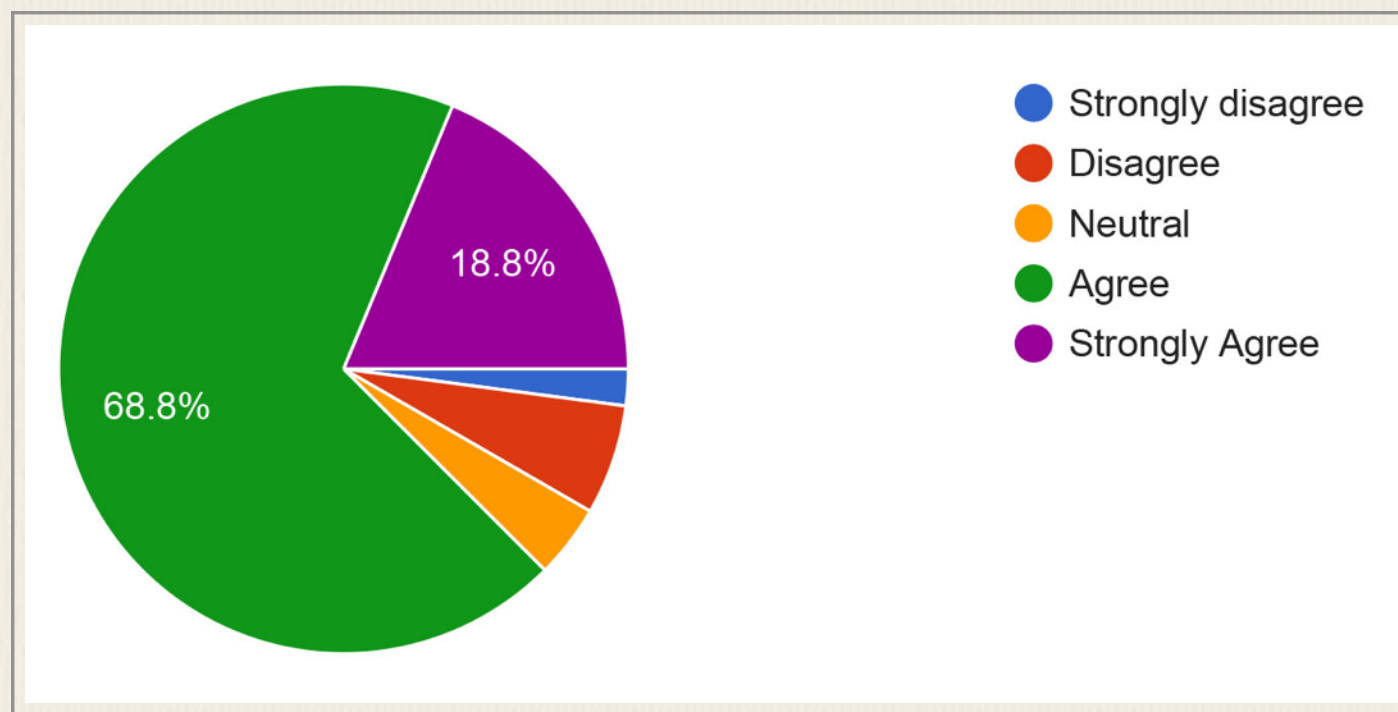
Strongly agree: 18.8%

Agree: 68.8%

Neutral: 4.2%

Disagree: 6.3%

Strongly disagree: 2.1%

There were a number of very useful comments. A number of students pointed out that the preparation for the presentation helped them to gain deep knowledge in one particular area, as they felt that they had to have deep knowledge and expertise in order to give an accurate presentation in front of the whole class. Thus, on of the students commented: "I need to learn about my given topic well enough before I can present it to my peers in an understandable manner." However, one student implied that because the presentation was only 4 minutes long, only surface knowledge could be presented. Nonetheless, the overall consensus was that preparing the presentation really helps the students to gain deep knowledge. And it is also likely that this experience and developing the ability to acquire deep knowledge independently will likely help the students in the future.

With regards to the presentation topic, one student pointed out that it was rewarding to be able to choose one's own topic. Contrasting this, one student commented "… I did realise that whenever there were overlaps in some topics, it was easier to follow the speaker! Perhaps, an order which leads up from basic understanding of the cell cycle to application of that knowledge might be a better way to reinforce our learning as well." After hearing the presentations I must say that I agree with the latter comment. Choosing of topics in a logical and overlapping order by the lecturer is not so much important to cover all important areas (as this is an impossible task and very subjective). But it is important to ensure that the audience can follow the presentations better and gain knowledge (see below).

With regards to the setting of application-based MCQ , it was acknowledged that setting of MCQ was helpful in deepening the concepts learned during the preparation of the presentation. However, the same is likely not the case for the audience, who often did not acquire enough knowledge (due to poor presentation quality or lack of attention or prior knowldege) in order to answer the questions. One student raised the concern that the students might misinterpret information or research findings in their chosen topic area that they read about and as a result, come up with inaccurate MCQ. Although the lecturer vetted all MCQ before the actual class, he does not have enough in depth knowledge about each presentation topic. And it is unrealistic to expect that he would spend the time to read up on the background for each topic.

Given that the questions are expected to be application based, the students tend to come up with very complicated questions. Of note, one student made the excellent suggestion to "have students explain the answers to their questions, so they do not just think about setting hard questions but rather, questions that really test our understanding." This is indeed an excellent suggestion that would likely address the MCQ related difficulties.

QUESTION 2: I gained useful skills from preparing and giving the group presentation and setting up the MCQ.
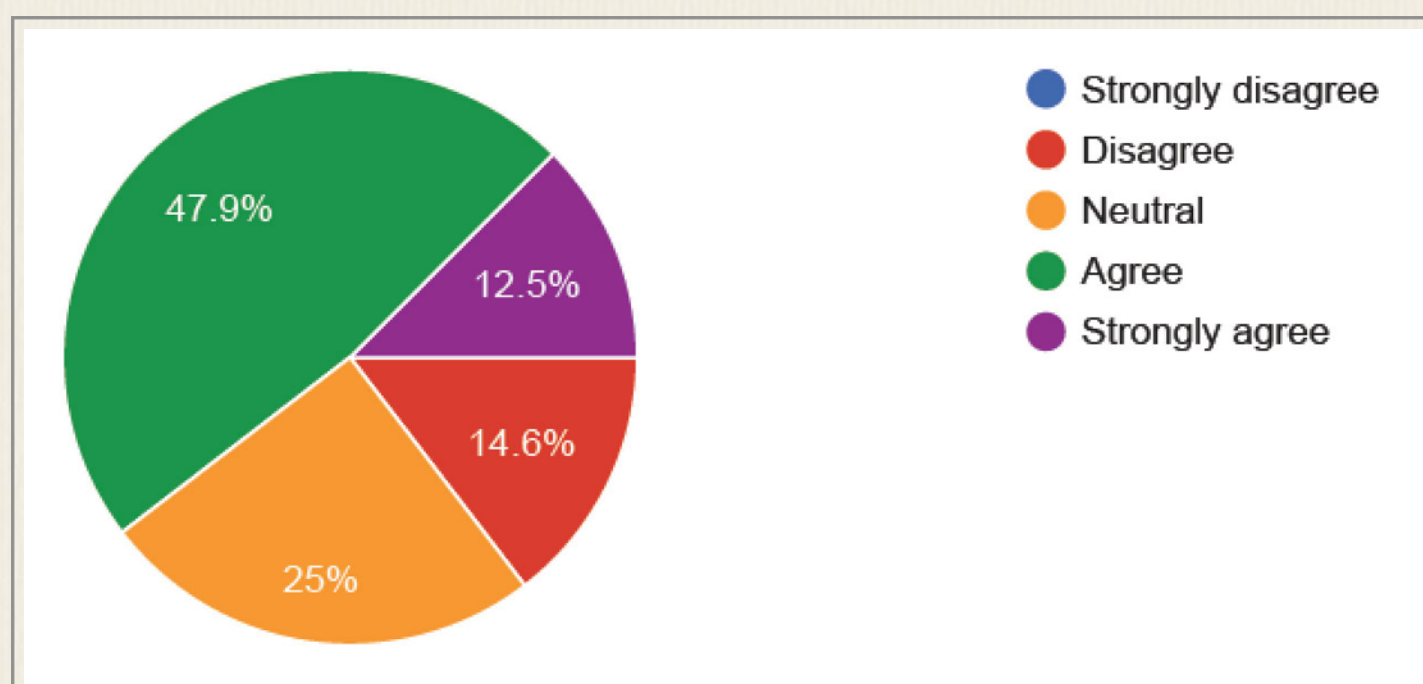
Strongly agree: 12.5%

Agree: 47.9%

Neutral: 25.0%

Disagree: 14.6%

Strongly disagree: 0%

It was somewhat unexpected that the students generally felt they gained more knowledge than useful skills from preparing and giving the presentation and setting of the MCQ, especially given that the acquisition of useful skills was one of the major, if not the major, learning outcome of these activities. The skills that could be developed include presentation skills, independent acquisition of knowledge, critical analysis, applying of learned knowledge and team work. It is possible, however, that the students did not consider some of these as 'skills', since no examples were included in the survey (which should be improved in future projects).

With regards to the presentation skills, it must be acknowledged that the quality of the presentation was generally poor, with only a few very good presentation. The relatively low quality of the presentations prevented that the audience gained much new knowledge during the sessions. The main problem was not the delivery of the presentation, but rather the structure and content (insufficient background; too much detail on facts and findings that were not relevant for the main topic of the presentation; lack of summaries or recaps). I personally was initially surprised by this, given that the individual 3 min video presentations, which the students had to prepare during an earlier assignment in the same module, were generally excellent, with many outstanding videos.

Analysis of the differences between the video and presentation assignments revealed lack of clear instructions and lack of examples to which the students can aspire as major problems. For the video assignments, I gave the students very clear guidelines about the structure. Thus, I highlighted to the students that they should be concentrating on essential information and that it is important to make the presentation engaging and easy to follow by including an interesting beginning, a concise introduction that is too the point and a good ending. There are also many examples of student video assignments from previous semesters easily accessible via youtube. None of these were available for the in-class group presentation assignment.

As an example of how important clear instructions and examples are, I want to highlight my instructions to students with regards to the topic they chose for their presentation:

Topic: I would like you to choose one specific application question. The question should start with "Why….?" or "How….?" I have uploaded a number of examples in this google document.

(link)

If you want you can choose these topics (only one team per topic) by indicating your team number besides the topic, or choose a new topic and submit it into the google document with your team

number. Try to choose a topic that is different from those that have already been chosen. I will check the topics a few times daily and approve them if ok. If you really cannot find a topic yourself, you can email me and I will give you one.

Of the approximately 40 uploaded topics, only two or three topics required any amending. All other chosen topics were concrete, relevant and clearly formulated. Giving of examples clearly helped the students. A similar approach should be adopted for other parts of the group assignment.

One other aspect that was likely missing in ensuring a good quality as well as a more useful learning experience was the lack of feedback. In a graduate module, I have previously conducted a 3 min presentation assignment, where each student gave an initial non-graded presentation, followed by a 10-15 min discussion in class where both lecturer and students provided detailed feedback and made some suggestions, followed by the final, graded presentation 1 to 2 weeks later. The improvement were nothing short of remarkable. Although a similar approach is not possible in the setting of a large class, it if feasible to pair up the groups to provide peer feedback prior to the presentation. Combined with the availability of examples, this is likely to improve the quality of the presentation.

Nonetheless, the assignment is likely to have helped the students to develop a number of skills. Besides the development of presentation skills (mentioned by several students), these skills include the independent acquisition of knowledge, one of the key skills required for lifelong learning and problem-solving. Of note, one student highlighted that there was contradictory information in the literature. On the one hand, this is a complicating factor. On the other hand it also prepares students for the reality that available information on most scientific topics is not always in agreement, as the student points out: "… In a way, I think it is good because that is the nature of science - constant discovery and refinement based on new findings. I don't really have a suggestion to resolve this but this might be a good problem to have since we learn to choose credible sources."

By coming up with MCQ questions, the students also had the opportunity to apply what they have learned. One student remarked: "... setting up the MCQ allows me to design the questions in such a way that tests on certain key concepts that I want my peers to learn and apply through attempting those questions."

Another important skill that is very relevant for the students' future career is their ability to work in a team. However, with regards to the team work aspect, one student remarked that "… group work was minimum as we all did our parts …" To promote genuine group work that involves groups coming up with solutions together, it might be helpful to implement the above mentioned peer feedback.

QUESTION 3: I learned new knowledge from the presentations of my peers and answering their MCQ.
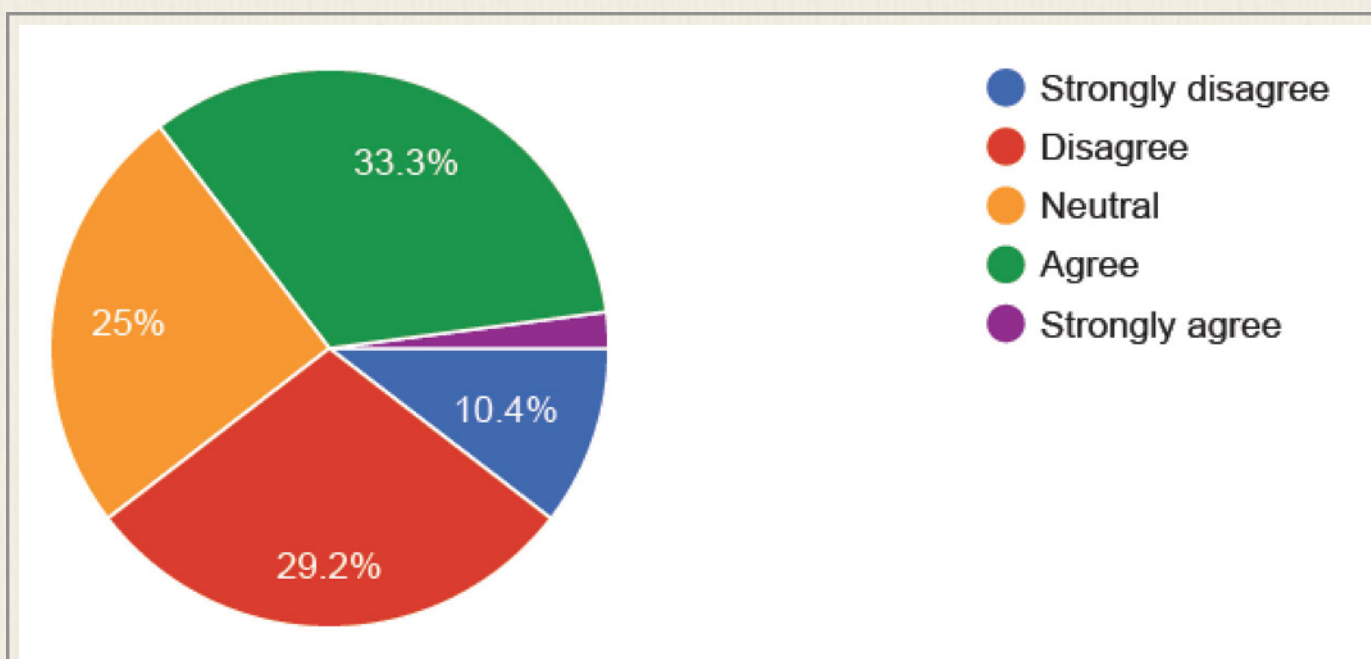
Strongly agree: 2.1%

Agree: 33.3%

Neutral: 25.0%

Disagree: 29.2%

Strongly disagree: 10.4%

This question had the poorest outcome and the objective that the students learn and apply new knowledge from the presentations and multiple choice questions, respectively, was clearly not met. The comments were nearly unanimous. The presentations were not clear, did not contain enough background information and covered way too much content. As a result, it was difficult for the students to answer the MCQ, which were often very difficult. Hence, it is important to improve the quality of the presentations, using steps that are described above.

In addition, a number of students raised a number of other points. Some students commented that the questions composed by the students were often too complicated and often impossible to answer based on the presented content. Hence, the questions did not really test the understanding of the students. On the other hand, as mentioned above, the students felt that the MCQ setting was helpful, and hence likely met the objective to promote independent learning and application of learned knowledge for the presenting students. The MCQ also greatly increased the engagement of the students in the audience. Nonetheless, it would be important to improve the quality of the MCQ, through better vetting by the lecturer, possible testing of the questions during the peer group feedback before the actual presentation (see above), and by letting the students who set the MCQ explain their own answers (see also above).

An important point to consider is whether the students need to answer the MCQ immediately after the presentation or whether time is given to the students to answer the questions after the lecture. Both approaches have their advantages and disadvantages, as highlighted in the table.

	Students have to answer the questions immediatey during the lecture	Students are given time to answer the questions after the lecture
Lecture attendance	PRO: Students are more likely to attend the lecture	CON: Students may not attend the lecture, especially given that the presentation sessions are webcasted
Student workload	PRO: Students can complete the learning activities during the lecture	CON: Students need to spend extra time out of class, which creates additional workload
Discussion with peers	PRO: Students are more likely to engage in discussion with peers, provided enough time is given; cheating may occur where student groups exchange answers via social media	CON: Students may be more likely to cheat and distribute answers via social media
Learning outcomes	CON: Student engage with learned concepts immediately, but answering MCQ during the lecture can be stressful, especially if the time given is limited	PRO: More time for deep engagement with learned concepts

In my sessions, I used a combined approach, letting students answer easier questions during class and more difficult questions out of class. However, given that the time given to answer the MCQ in-class was limited, a number of students commented that answering the MCQ in-class was stressful. Hence, to promote student learning, it is recommended to let the students answer the MCQ after the class.

As mentioned in the table, one problematic issue is cheating by distributing answers via electronic media and social media. According to comments by students, cheating occurred for MCQ that had to be answered both in class and out of class, whereby students forwarded the answers to the MCQ that they set to other students. The answers were primarily sent to their friends, illustrating the well-known fact that cheating is more common among groups of friends.

It is also well-known that the question format (MCQ) is particularly susceptible to cheating. Answering short answer questions is much less likely to elicit cheating behaviour. However, one major objective was that the presenting students apply what they have learned by coming up with questions. And setting of high quality, application based MCQ is intellectually more challenging compared to coming up with short or long answer questions. Hence, setting of MCQ likely met the learning objectives of the assignment better.

The best way to address cheating of students is probably by discussing this issue during the class, where the lecturer communicates his/her expectations clearly (Tatum and Schwartz, 2017). This includes making it clear to the students what kind of collaboration and group work is appropriate and what kind of work constitutes cheating. Communicating expectations is important because students often have different views and preconceptions about which behaviour is acceptable and which is not and because cheating via electronic means is often viewed by students as less severe (Tatum and Schwartz, 2017). Furthermore, it has been shown that students without a clear perception of what constitutes cheating are more likely to engage in cheating behaviour (O'Neill and Pfeifer, 2011).

It is also a good practice to include at the beginning of an assignment a question where students need to confirm that they have not cheated (for instance in the case of the described assignment, "I did not distribute my MCQ answers", or "I did not receive any MCQ answers"). This is a reminder to students of what the expectations for the assignment are.

Academic honor codes are also well known to reduce cheating behaviour. The National University of Singapore does have an honor code and the students sign a pledge to abide with this code. that the students pledge to abide with this code. However, according to Tatum and Schwartz (2017), a traditional honor code in-

cludes in addition to the honor pledge also a peer-reporting requirement, a student-run adjudication system, and a requirement that faculty turn all suspected cases over to the judiciary body. Nonetheless, it is a good practice to remind students of their honor code pledge before the assignment.

NUS HONOR CODE

As a member of the National University of Singapore (NUS), a candidate is expected to maintain the highest standards of personal integrity and to respect the rule of law, social order, the rights of others and abide by the statutes, regulations and rules of the University as are expected of all members of the University, both within and outside the University.

Students must uphold and maintain absolute academic honesty and integrity at all times. Forms of academic dishonesty include but are not limited to cheating, giving or receiving any improper aid, fabrication, plagiarism or participation in any action that compromises the integrity of the academic standard of the University. All students will be given a copy of the NUS honor code at matriculation, and will sign a pledge to abide with this code.

Failure to abide by the Honor Code may be sufficient cause for expulsion from the University.

Addressing cheating when it has occurred is important, as it has been shown that the strongest predictor for cheating is witnessing of cheating by other students(O'Rourke et al., 2010; (McCabe & Trevino, 1993). Based on the honour code described above, it can be considered to appoint a student committee (student honour council) at the beginning of the semester, who in the event of any reports or rumours of cheating, investigates any cheating behaviour and breaches in the honour code to which the students have committed. This committee could then make recommendations to the lecturer to deal with the cheating behaviour.

QUESTION 4: Although I learned much less factual knowledge compared to normal lecture based teaching, the skills learned during this part of the module will be more useful in the long term.
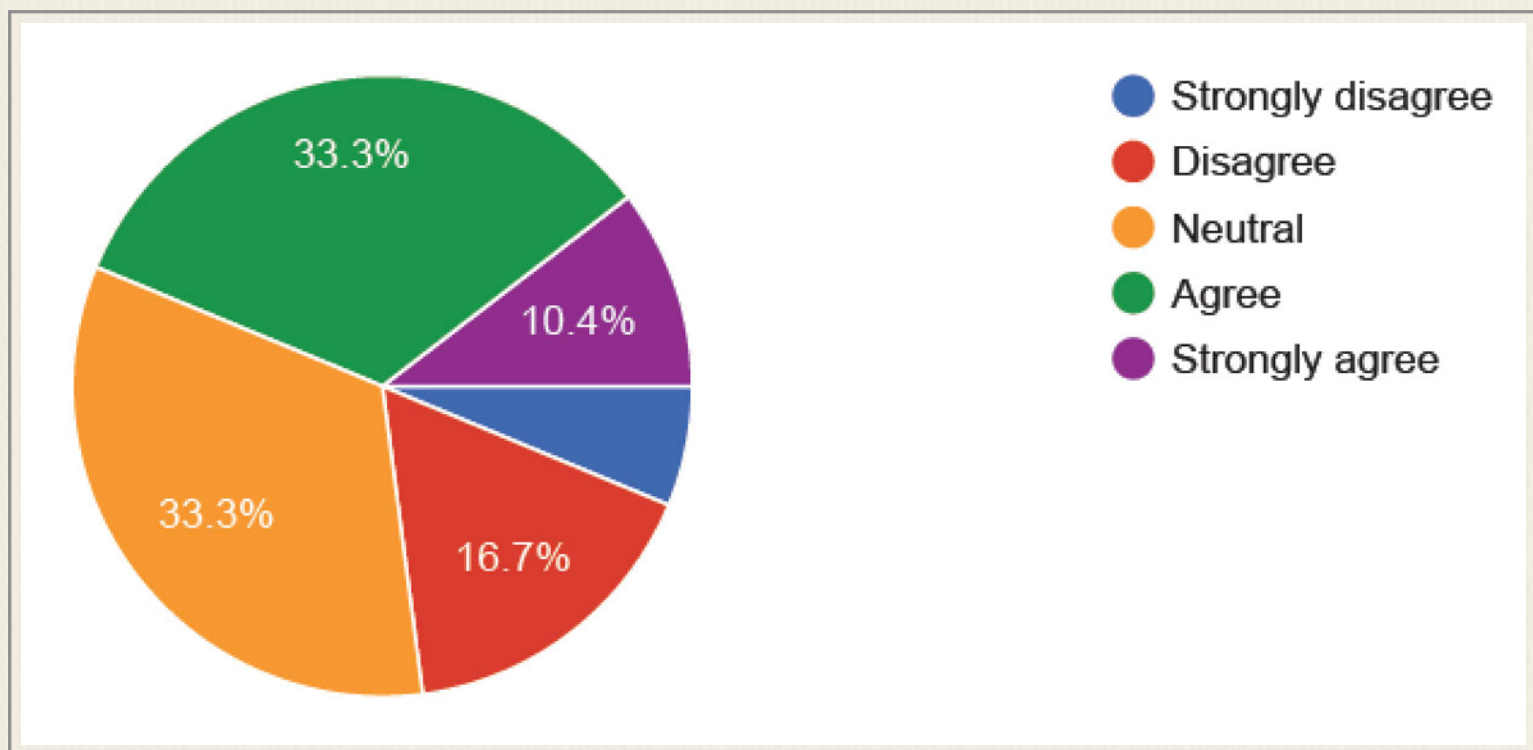
Strongly agree: 10.4%

Agree: 33.3%

Neutral: 33.3%

Disagree: 16.7%

Strongly disagree: 6.3%

Some of the positive outcomes mentioned by the students included getting used to reading through content heavy research papers and developing the skill to pick and choose information from credible sources. The sessions also helped to improve presentation skills and recognise the challenges of presenting in front of a large audience and capturing students' attention.

Nontheless, although there were more students who agreed with the statement that useful skills were learned compared to students who disagreed, there were various students who expressed that they learned no significant additional skills during

the activities. Some students also pointed out that the sessions did not help to establish a foundational knowledge in the covered topics. This in turn may impede student's preparedness, understanding amd performance in future modules.

In response to these comments, I think it is important to highlight to the students the importance of gaining independent learning skills, which often is not appreciated by the students (a common student comment: We have to do the work of the teacher.). It is also important to explain the learning outcomes more clearly.

Based on the student feedback and my own reflections on the assignment, I would make the following recommendations for the successful implementation of group presentations into a large class module.

Recommendations for group presentation in large group classes:

-It is important to explain the intended learning outcomes clearly at the beginning of the assignment.

-It is necessary to give clear instructions for all assignment components. Specific examples should be provided.

-The presentation topics should be chosen by the lecturer and be presented in a logical manner to help students built on new knowledge and improve the learning outcome.

-It is recommended to let the students set application based MCQ based on their presentation, which are to be answered by the students in the audience in a take-home assignment (to prevent time pressure). Importantly, the answers to the MCQ should be explained by the presenting students.

-It is recommended to pair up the groups to provide peer feedback prior to the presentation.

-To prevent cheating, the lecturer should clearly explain the expectations at the beginning of the assignment, and remind the students of their pledge to abide by the honour code. To address cheating when it has occurred, it can be considered to appoint a student honour council at the beginning of the semester which investigates any alleged cheating behaviour and makes recommendations to the lecturer.

References

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