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Keywords

student presentations, online presentations, screencast, presentation anxiety, peer assessment, cooperative/collaborative learning

Erratum

Minor editorial revisions identified by the author have been actioned. Modifications have been made to the formatting of the paper to preserve the integrity of the figures and tables.

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Comparative Evaluation of Online and In-Class Student Team Presentations

Introduction

Student team presentations frequently feature in tertiary science courses, as they provide a convenient platform for the development of desirable graduate attributes, in particular communication, teamwork and research skills (Frawley, Dyson, Tyler & Wakefield 2015; Girard, Pinar & Trapp 2011; Gow & McDonald 2000). The pedagogic promise in students preparing and presenting their work to their peers lies ultimately in a deeper engagement with the content (Doree, Jardine & Linton 2007) and greater participation in class. Joughin (2007) reports that students found the experience of presenting to peers demanding, requiring deeper understanding and leading to better learning. Recently, several factors combined to encourage recasting the student presentations as online content. The unprecedented levels of digital literacy in the current generation of undergraduate students make it attractive for teachers to build on the skills and the confidence students bring in, and to structure their learning experience with the aid of digital media (Bates 2015). The modern workplace these students will enter upon graduation is likely to integrate digital media into its communications tool set. Hoban (2016) makes a strong case for students creating digital-media explanations, arguing that learning is enhanced when students revisit concepts using different modes of communication. Another factor is the introduction of blended-learning models across the sector, with their mixtures of online and in-class learning, providing students with a greater freedom to choose the time and place of learning, and allowing them to tackle the content at their preferred pace (Garrison & Vaughn 2008; Ford, Burns, Mitch & Gomez 2012). For example, Morris and Chikwa (2014) report that screencasts had a significant positive impact on student learning. Finally, many tertiary-education providers face larger classes without a concomitant increase in the number of teaching staff. For example, in Australian universities, the student-teacher ratio rose by 38% during the period 2000-2010 (Larkins 2011), prompting a search for more efficient delivery and assessment modes (Mayotte 2012; Frawley et al. 2015; McBain et al. 2016).

Online and in-class presentations

Student-generated digital presentations, implemented with a variety of tools, have recently been reported in a number of contexts. Teachers seek to incorporate these to foster creativity and collaboration (Hazzard 2014) in courses such as computer programming (Powell & Wimmer 2014), accounting (Frawley et al. 2015), language studies (Fernández-Toro & Furnborough 2014), pharmacology (Reyna & Rodgers 2016), mathematics (McLoughlin & Loch 2012; Lazarus & Roulet 2013), and nursing (Pereira, Echeazarra, Sanz-Santamaría & Gutiérrez 2014).

Given the well-recognised pedagogic value of traditional in-class student presentations (Joughin 2007), it is prudent to ask whether replacing them with online presentations offers similar learning experiences and encourages a similar quality of academic performance. Can we be confident that online presentations are an authentic alternative to, or replacement for, the traditional classroom experience?

Studies that directly compare online presentations with the traditional face-to-face, oral, in-class presentation in the same cohort of students are sparse in the literature. Woodcock (2012) introduced student-created digital presentations in a political theory class, motivated by a desire to free seminar time and reduce student anxiety. The surveyed students indicated that they could

readily handle the technological challenges of preparation and that, while appreciating that this mode of presentation reduced anxiety, they did not necessarily want oral presentations to be entirely removed. Barry (2012) video-recorded oral presentations in a business-studies class to provide a means of feedback and self-assessment; students found it engaging and beneficial.

McBain et al. (2016) reviewed student experiences and concluded that online presentations were a valid, engaging and successful method for student learning. However, their study did not compare student experiences to the traditional face-to-face presentations. Holland (2014) described the use of online student presentations in a business-studies course, focusing on the professional and practical benefits of web-based multimedia technology and peer assessment, but did not attempt to make comparisons with the traditional presentation mode. Campbell (2015) asked students to prepare two individual presentations, a webinar and a face-to-face presentation, in a course on public speaking. In both modes, the presenter and the audience were present concurrently but the webinar reached audiences in multiple locations (an early example of such a scheme was described by Braun, Town, Hudson and Holley, 1993). In a survey, 13% more students indicated a preference for the webinar than for the face-to-face presentation, and most students reported experiencing a greater level of anxiety in face-to-face presentations (Campbell 2015). The synchronicity of the webinar mode and the technical constraints imposed on it place it in a different category to typical online presentations.

This study aims to fill the gap in the literature by assessing student perceptions of the two modes of presentation and examining correlations of academic performance with the presentation mode.

The current study

In the subject Medical Imaging, the team presentation accounts for 25% of the total assessment. The subject is offered primarily to medical-science undergraduate students in their senior year, and also to engineering students in the bioengineering stream and to master's students. The task is carried out in self-selected teams of three students. In previous years, student presentations were given in class, with questions from the audience and peer assessment. Student feedback indicated that the large number of presentations assessed led to diminishing engagement and peer-assessor fatigue, with the potential for poor-quality marking and a detrimental effect on the peer-teaching function. It was also recognised that the presentation task provided limited opportunities for enhancing the students' skills in the use of digital media technology. In 2016, in anticipation of logistical constraints, and making use of available expertise in instructional digital media technology, a trial was set up where both online and in-class modes of presentation were made available. Irrespective of the mode chosen, the timeline of seven weeks of work, including two opportunities for feedback (Figure 1**),** was the same. In week 2 of the semester, students teamed up, selected a topic from a list provided and chose either the online or in-class mode of presentation. In week 9 all presentations were given and peer assessment was completed. Feedback on the outline of the presentation and on the full draft was made available where indicated by downward arrows.

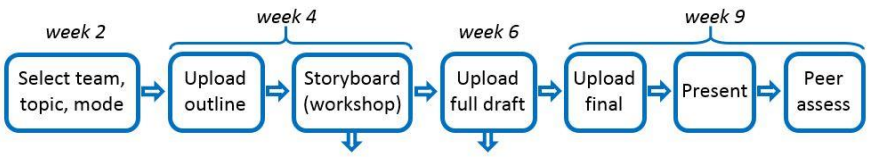


Figure 1. Timeline of the presentation assignment from the student's perspective.

The students received two major instructional resources: an online lecture on presentation techniques and a storyboarding workshop presented by a staff member with multimedia experience (who also prepared the online lecture). In addition to the feedback provided in the workshop, students were encouraged to post their draft presentations to a secure site for further feedback from staff.

Although several presentation formats were discussed, no particular format was prescribed. Nearly all in-class presentations adopted a PowerPoint slide format. The majority of online presentations chose a screencast format, with a significant number of teams experimenting with animation and video techniques.

Method

Two instruments were used in this study: a student survey designed to test perceptions of the in-class and online modes of presentation and an analysis of marks intended to determine whether the choice of the presentation mode had an effect on academic performance.

Instruments

The survey was approved by the university's Ethics Committee (ETH16-0441). It was administered in class under student control (with the lecturer absent) using a multiple-choice answer sheet for closed-ended questions and a sheet for open-ended questions, as well as via anonymous Google Forms, open for two weeks, for those who did not attend the class. No significant differences in responses were detected between the survey administered in class and online (except for Q11 in Table 1, with online respondents reporting greater anxiety, although the number of online respondents was relatively small). The survey was administered in week 10 after the presentation task marks had been finalised and made available to the students.

The initial part of the survey comprised multiple-choice questions to establish the demographic profile (age bracket, gender, course of study and whether English was the first language). The respondents were also asked to specify whether their team presented online or in-class.

The remaining survey items are listed in Table 1 (except for two items referring to the specific resources provided to the students, and unrelated to this study). They pertain to respondents' attitudes to information technology and their perceptions of the impact of the presentation task on research skills, teamwork and presentation skills. The questions were expressed as statements in the first person, and the respondents selected an answer from the following options: *strongly disagree*, *disagree*, *undecided/neutral* (hereafter shortened to *neutral*), *agree* and *strongly agree*. In the numerical analysis, the five categories of response were coded on a Likert scale from 1 to 5, respectively. The last two items were generic, open-ended questions that provided an opportunity for respondents to comment on the principal benefits and challenges of the presentation task.

The academic performance in the presentation task was assessed by analysing unmoderated team marks. The final mark a student received was the total mark for the team's presentation adjusted, if required, by the SPARK^{PLUS} SPA factors (Willey & Gardner 2010), which reflect the relative contribution of that student to the team's effort. Because the marks received by individual members of a team would be highly correlated, statistics of the team marks rather than of the individual marks were evaluated.

Code	Item
In relation to technology such as computers, smart phones, tablets, etc.	
Q01	I enjoy using technology for personal/recreational matters
Q02	I am confident using technology for personal/recreational matters
Q03	I enjoy using technology for learning
Q04	I am confident using technology for learning
Q05	The assignment helped me develop skills in searching and analysing published material
Q06	I engaged strongly with the topic
Q07	This assignment has enhanced my skills with digital presentations techniques
Q08	This assignment helped improve my collaborative skills
Q09	My team worked well together
Q10	I enjoyed working with my team
Q11	Presenting my team's work to my peers made me anxious
Having watched both in-class and online presentations, I believe that:	
Q12/Q13	In-class (Q12)/online (Q13) presentations made a greater impact on me
Q14	The impact of a presentation on me is not dependent on its mode (online/in-class)
Q15	The mode (online/in-class) I chose required more preparation than the other mode
Q16	The mode (online/in-class) I chose would effectively prepare me for communication tasks in future career
Q17/Q18	In my experience as a peer assessor I found it easy to learn from online (Q17)/in-class (Q18) presentations
Q19/Q20	In-class (Q19)/online (Q20) presentation offers scope for higher grades
Q21	Given the choice of online/in-class mode of presentation, I would make the same choice in future
Open-ended questions	
OQ1	What was most beneficial in the presentation assignment?
OQ2	What were some of the challenges you faced in the presentation assignment?

Table 1. Items presented in the student survey Items Q01-Q04 relate to the use of digital technology, items Q05-Q10 relate to perceived benefits of the presentation assignment, item Q11 probes presentation anxiety, items Q12-21 focus on the differences between in-class and online modes and open-ended questions invite comments on the benefits and challenges of the assignment.

To promote greater involvement in their own learning (Rosa, Coutinho & Flores 2016), each student took part in assessing other teams' work, comprising two in-class, and four online, presentations (thus each presentation was assessed by a similar number of peers, 17 on average). While attempting to make the assessment mode-blind, it was recognised that there were two principal inherent differences in the process of assessing presentations in the two modes: online presentations' capacity for playback and asynchronicity of response to questions. Students assessing online presentations were able to view the videos in full, or in part, any number of times. Clearly, such a playback facility was not available for in-class presentations. In recognition of the asynchronous nature of online presentations, the presenters were given 24 hours to respond to viewers' questions. Assessors of in-class presentations were asked to bear in mind the constraint of having to provide an instantaneous response to questions. It might be possible to adapt the process of assessing online presentations to avoid these differences (for example, by allowing only a single viewing of the videos, and by scheduling questions and answers in a concurrent webinar

format). However, practical difficulties in implementing such adaptations would be considerable. More importantly, the adaptations would hobble important features of online presentations and would threaten the validity of the comparison.

Online presentations were posted to a YouTube channel in week 9 and were open for assessment for one week. Questions from assessors and others were posted as comments. Peer assessment was carried out in a rubric on a SPARK^{PLUS} platform (Willey & Gardner 2010). Individual students' contributions to the team's work were subject to self- and team assessment (also carried out in SPARK^{PLUS}), providing opportunities for reflection and feedback.

Criterion	Short name	Weight/24	Marker
Depth of research	*Depth*	3	A
Structure: keeping to time, logical flow, appropriate emphases	*Structure*	3	A
Use of digital media	*Media*	3	A
What is the topic?	*What*	2	P+A
Why is it important?	*Why*	3	P+A
Pros and cons	*Pros.cons*	3	P+A
Conclusions	*Conclusion*	3	P+A
Evoking interest	*Interest*	2	P
Answering questions	*Answering*	2	P+A

Table 2. Marking rubric criteria and associated weights. Marker A = academic, P = peer.

Participants

The participants in this study were students enrolled in the subject Medical Imaging. Fifty-one students (45% of the cohort) responded. Respondents provided demographic information as part of the survey. The predominant demographic profile was that of a young, female native-English speaker. The respondents were 63% female, a somewhat greater proportion than that for the entire cohort (55%). Most of the participants were young (71% under 22 years old). The female respondents were typically younger (78% under 22) than the males (58% under 22). English as a second language (ESL) students made up a substantial proportion (37%) of all respondents.

The respondents' majors came largely from three categories: undergraduate medical science (41%), undergraduate engineering (22%) and postgraduate (16%). The remainder came from a variety of undergraduate majors. The proportions were similar to those in the entire cohort (42%, 16% and 10%, respectively).

The sample comprised 18 (35%) in-class presenters and 33 online presenters. The proportion of in-class presenters was somewhat lower (25%) for the entire cohort.

Data analysis

In the analysis of the survey responses, unless otherwise specified, the quoted percentages refer to the proportion of the respondents (or of a specified subset of respondents) who agreed or strongly agreed with a statement.

Analysis was carried out in the R programming language (R Core Team 2016). Normality tests included measurements of sample skewness and excess kurtosis, with the aid of the software package *moments* (Komsta & Novomestky 2015), q-q plots, and the Shapiro-Wilk test. For eight survey items, significant skewness was inferred at a 0.05 level. Of those, three distributions also indicated significant kurtosis. The results were further confirmed by q-q plots. The Shapiro-Wilk test rejected the null hypothesis of normal distribution for $\alpha = 0.05$ in all responses. Nonparametric testing was therefore used in the form of the Wilcoxon rank sum test to analyse the response data with binary stratification; the Kruskal and Wallis test was used if more than two categories were present. The effect size was measured using Cliff's delta (Cliff 1996) with the aid of the R package *effsize* (Torchiano 2016). The diverging stacked bar charts were prepared in R with the aid of the package *HH* (Heiberger & Robbins 2014), and the bar chart in Figure 5 was produced using the R package *ggplot2* (Wickham 2009).

The final team marks were initially analysed for a significant difference between in-class and online teams using a two-tailed t-test, and the effect size was measured with Cohen's d value. Similar normality tests were applied to the mark distributions. For several criteria (but not the final mark), the mark distributions exhibited significant deviations from a normal distribution; hence nonparametric testing was applied (Wilcoxon ranked sum, two-tailed test evaluated at the 0.05 significance level) and Cliff's delta was computed.

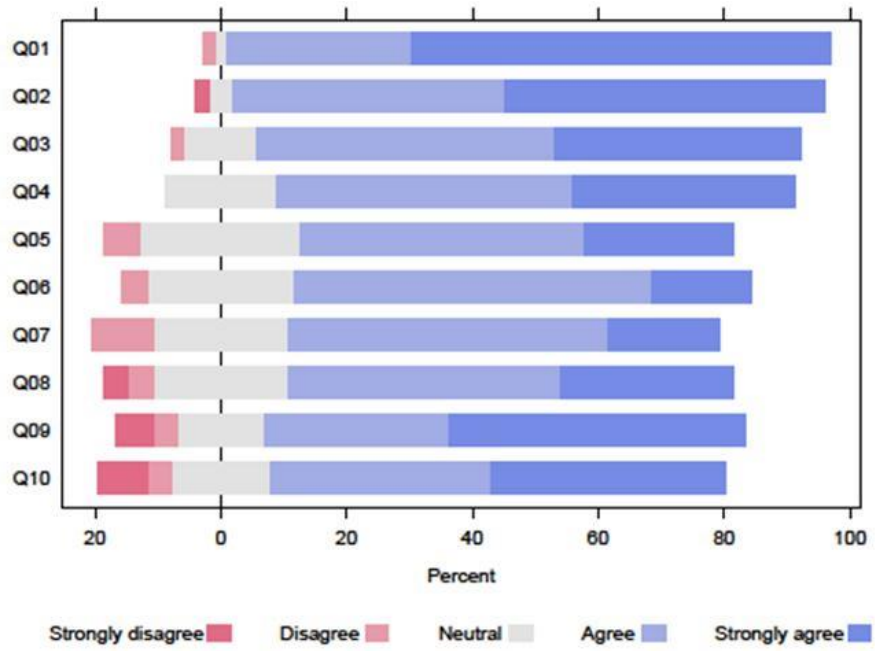
Results and discussion

Mode-blind analysis of survey responses

The first 10 items of the student survey (Table 1) do not explicitly differentiate between the in-class and online presentation modes. Blocks Q01-Q04 relate to the use of digital technology, and blocks Q05-Q10 broadly explore perceived benefits of the presentation assignment. The aggregated responses to these items are shown in Figure 2. The distributions are strongly skewed toward the positive for both blocks.

Use of technology

The respondents overwhelmingly reported enjoying the use of digital technology for personal/recreational activities (96%) and claimed confidence in such use (94%) (Q01 and Q02, respectively). This is not surprising, given that the majority would qualify generationally as "digital natives" (Prensky 2001). The concept of the digital native has been qualified by recent studies that suggest that many young people's digital mastery is in fact superficial and incomplete (Selwyn 2008; Margaryan & Littlejohn 2008; ECDL 2014). Furthermore, there may be a large gap between self-assessment and the true status of digital skills (ECDL 2016). Nevertheless, the focus here is on students' perceptions rather than objective measures of skills.



Code	Item	Code	Item
In relation to technology such as computers, smart phones, tablets, etc.		Q05	The assignment helped me develop skills in searching and analysing published material
Q01	I enjoy using technology for personal/recreational matters	Q06	I engaged strongly with the topic
Q02	I am confident using technology for personal/recreational matters	Q07	This assignment has enhanced my skills with digital presentations techniques
Q03	I enjoy using technology for learning	Q08	This assignment helped improve my collaborative skills
Q04	I am confident using technology for learning	Q09	My team worked well together
		Q10	I enjoyed working with my team

Figure 2. Aggregated responses (n = 51) to each of the survey items Q01-Q10. Each diverging stack bar has length 100%. The lengths of its coloured sections show the proportion of respondents who selected the corresponding Likert-scale options. The bars are aligned at the centre of the "neutral" band.

With regard to the use of technology for learning, the response rates for Q03 and Q04 were lower but still strong (86% for enjoyment and 82% for confidence, respectively). Despite the already high level of confidence in the use of technology, 69% reported that they benefited by enhancing their skills in the use of digital-presentation techniques (Q07), which probably reflects the fact that most students employed unfamiliar software.

Perceived benefits of the presentation task

Overall, the respondents appeared to view the assignment in a positive light. Specifically, the survey probed whether their research, teamwork and communication skills were enhanced by the experience. Sixty-nine percent of respondents agreed with the statement that the task helped them develop skills in searching and analysing published material (Q05). With regard to teamwork, 70% of respondents indicated that the task improved their collaborative skills (Q08), 72% reported enjoying teamwork (Q10) and 76% agreed that their team worked well together (Q09).

Most respondents (77%) believed that their work on the presentation effectively prepared them for communication tasks in their future careers (Q16, Figure 4). A greater proportion of in-class presenters (89%) than online presenters (69%) agreed with statement Q16, implying that students more readily associated direct, real-time, in-class presentation skills with a future career than they did the skills required for asynchronous online communications. Nevertheless, when comparing the full sets of responses from the two groups, no significant ($p = 0.05$) difference was detected using the Wilcoxon rank sum test.

As student engagement with the content is one of the most important pedagogic goals, it is reassuring to note that nearly three-quarters (73%) of respondents considered themselves to have engaged strongly with the selected topic of the presentation (Q06).

Mode-differentiating analysis of survey responses

The analysis of the mode-specific items of the survey, beginning with the exploration of demographic distinctions between those students who elected to present online and in class. This is followed by an examination of presentation anxiety through responses to Q11 (presenting my team's work to my peers made me anxious). Although the item does not explicitly invoke mode differentiation, the main focus here is to explore the linkage between anxiety levels and the choice of presentation mode. The survey analysis concludes with an extraction of mode differentiation from the responses to the remaining items.

In-class and online presenter characteristics

The students were free to select an in-class or online presentation mode, and their choice may have reflected prior perception of what the task would entail. Before examining the students' responses to the survey items in Table 1, the demographic profile of the respondents partitioned into in-class and online presenter groups is considered. The demographic data in Table 3. Composition of in-class and online presenter groups by age, study major, familiarity with English, gender, enjoyment (Q03) and confidence (Q04) in using technology for learning, as well as enjoyment (Q01) and confidence (Q02) in technology for personal use. is a summary of responses to multiple-choice survey questions.

A comparison of the demographic data for the two groups of respondents shows that their age composition is similar, except that the in-class group has three times the proportion of the oldest students compared to that in the online group.

In terms of study majors, the two groups appear to have very different profiles, with medical-science students being most numerous (52%) within the online group, and engineering students and postgraduates being the most numerous within the in-class group.

Confidence in English appears to have been a significant factor in the choice of the mode. As shown in Table 3. Composition of in-class and online presenter groups by age, study major, familiarity with English, gender, enjoyment (Q03) and confidence (Q04) in using technology for learning, as well as enjoyment (Q01) and confidence (Q02) in technology for personal use., respondents for whom English was a second language were more numerous among online presenters (42%) than among in-class presenters (28%), possibly indicating a perception among the students that their notionally poorer command of English would be less of a handicap in an online presentation. Some online presentations featured a synthesised narrator's voice.

Category	Level	in class	online
Age	< 22 years	72%	70%
	22-25 years	11%	21%
	26-30 years	0%	3%
	> 30 years	17%	6%
Course	Medical science	22%	52%
	Engineering	33%	15%
	Postgraduate	28%	9%
	Other	17%	24%
English	1st language	72%	58%
	2nd language	28%	42%
Gender	Female	50%	70%
	Male	50%	30%
Technology for learning	Enjoyment	72%	94%
	Confidence	72%	88%
Technology personal	Enjoyment	89%	100%
	Confidence	94%	94%

Table 3. Composition of in-class and online presenter groups by age, study major, familiarity with English, gender, enjoyment (Q03) and confidence (Q04) in using technology for learning, as well as enjoyment (Q01) and confidence (Q02) in technology for personal use. The last four rows aggregate "agree" and "strongly agree" responses.

The in-class group had an older profile, with 17% over 30 years of age, compared to 6% of the online group. This may reflect a preference among the older students for a familiar presentation format. However, the number of such respondents (five) was too small to attach much significance to this observation. A typical online presenter is a younger (< 22) female majoring in medical science for whom English is the first language. A typical in-class presenter is a young female or male, majoring in engineering with English as their first language. Although female students made up half of in-class presenters, the gender ratio among the online presenters substantially favoured female students (70%).

Among the online presenters, 94% enjoyed using technology for learning (Q03), compared to 72% of the in-class presenters. Similarly, 88% of online presenters professed confidence in using technology for learning (Q04), compared to 72% of in-class presenters. Since the survey was administered after the task had been completed, it is not clear to what extent the responses reflect

the students' experience in this subject or prior experience. The differences for personal/recreational usage were less pronounced. All online presenters (compared to 89% of in-class presenters) enjoyed personal/recreational usage of technology (Q01). The proportion of those indicating confidence in such usage (Q02) was identical for online and in-class presenters (94%). The Wilcoxon rank sum test detected no significant differentiation at the 0.05 significance level between the presentation modes in responses relating to the use of technology (Q01-Q04).

Presentation anxiety

Many students find presenting to a class a daunting prospect, and presentation anxiety is a well-recognised phenomenon (Behnke & Beatty 1981; Hartman & LeMay 2004).

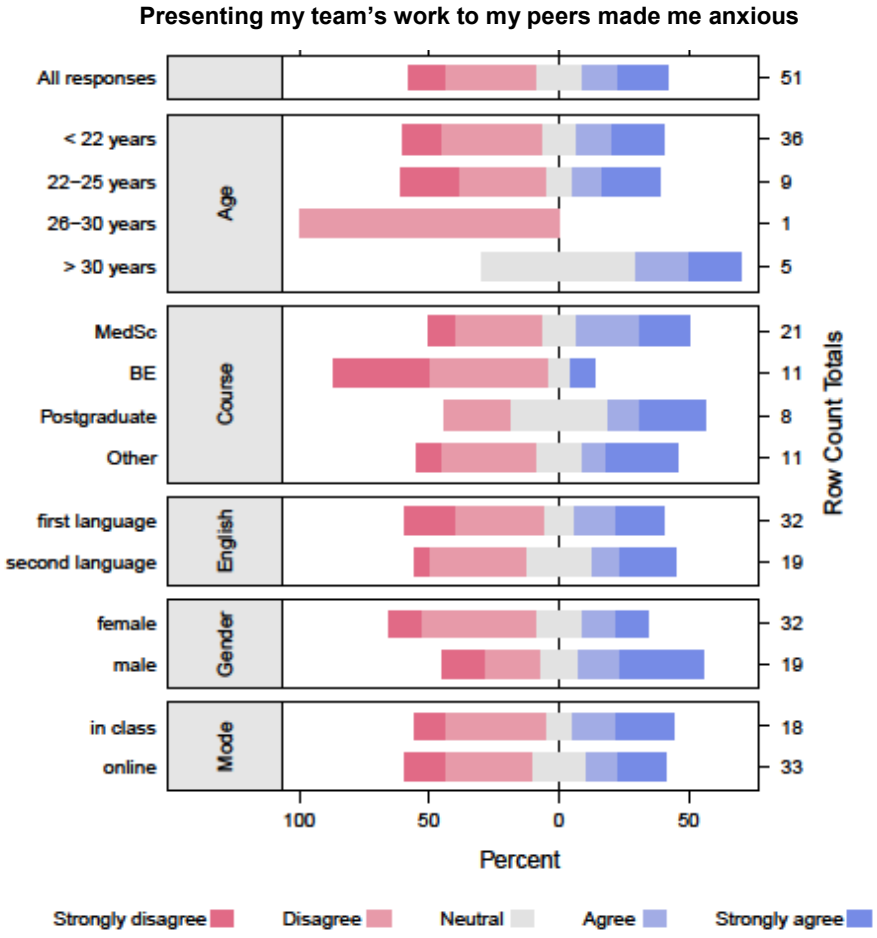


Figure 3. Summary of responses to Q11 categorised by age, study major, familiarity with English, gender, and the mode of respondent's presentation (in-class or online). The bar chart presents the data as a percentage proportion of respondents who selected colour-coded Likert-scale options. The bars are aligned at the centre of the "neutral" band. The number of respondents in each category (row count total) is given on the right of the chart.

In open-ended responses, an in-class presenter stated that "presenting in front of the class was anxiety inducing"; in contrast, an online presenter pointed out that the online mode was "beneficial for people who are nervous with public speaking". It is likely, therefore, that the choice of the presentation mode was affected by the anticipated anxiety level. That influence is tempered by the fact that the choice of mode was made by teams rather than individuals, and it is possible that it reflected the preference of the more dominant or persuasive member of the team. The distribution of responses to the "anxiety" item (Q11 "Presenting my team's work to my peers made me anxious") was examined focusing on the demographic data available in this study (Figure 3).

Behnke and Sawyer (2000) found that, where gender differences were detected in the level of student anxiety associated with oral presentations, female students manifested greater anxiety. A different bias appears in the responses to Q11, which prompts students to indicate a sense of anxiety about presenting their work to other students. As shown in Figure 3, while 25% of female respondents reported being anxious about presenting, the proportion of anxious male respondents was 47%. The apparent anomaly may be due to the higher proportion of female respondents in the online group (70%) than the in-class group (50%). Female students who felt anxious about presenting in class may have chosen the online mode because they perceived it would be less stressful. It may also be that changes introduced in schools since 2000, when the Behnke and Sawyer study was published, such as a greater use of student presentations, may play a part, as might the changing gender ratio in many tertiary courses. It should be noted that the Wilcoxon rank sum test did not find distinct distributions of responses to the anxiety item Q11 for females and males at the 0.05 significance level. Of the female in-class presenters, only one in nine reported anxiety, compared to six in nine males, whereas among online presenters, one-third of females and one-third of males reported anxiety. However, the logical conjunction of multiple conditions reduces the sample size to an extent that prevents meaningful statistical analysis.

Given the likely preference for the online mode among those who experience anxiety in presenting work to peers, the proportion of online presenters reporting anxiety should be substantially reduced. Yet 30% of online presenters reported anxiety, and the distributions of responses to Q11 for the two modes are very similar (Figure 3). The proportion is larger for in-class presenters (39%) but the two distributions of responses are not statistically distinct at the 0.05 significance level. Similarly, respondent's age appeared not to influence the self-reported anxiety.

So-called "foreign-language anxiety" has been the subject of extensive research, particularly in the context of language studies (Horwitz et al. 1986; Horwitz 2010), but also in association with oral presentations by tertiary-level students for whom English was a second language (Woodrow 2006). However, the distributions of responses of those for whom English was a first versus a second language did not demonstrate a significant difference in this study.

To distinguish between the four majors (undergraduate medical science, undergraduate engineering, undergraduate other and postgraduate), the Kruskal-Wallis rank sum two-tailed test was applied. The responses to the "anxiety" item Q11 showed no difference at the 0.05 significance level. Extending the analysis to the other items of the survey showed significant differences only in response to Q04 (χ^2=9.0), Q14 (χ^2=9.0) and Q19 (χ^2=9.9). In all three cases, medical-science students tended to respond with a lower score than the engineering and postgraduate students. Q04 relates to confidence in the use of digital learning technology, and the engineering students were likely to have experienced a considerable range of such technologies in their courses. Despite that, such students tended to choose the in-class presentation mode, perhaps in the belief that it offered the scope for higher grades (Q19). Compared to medical-science

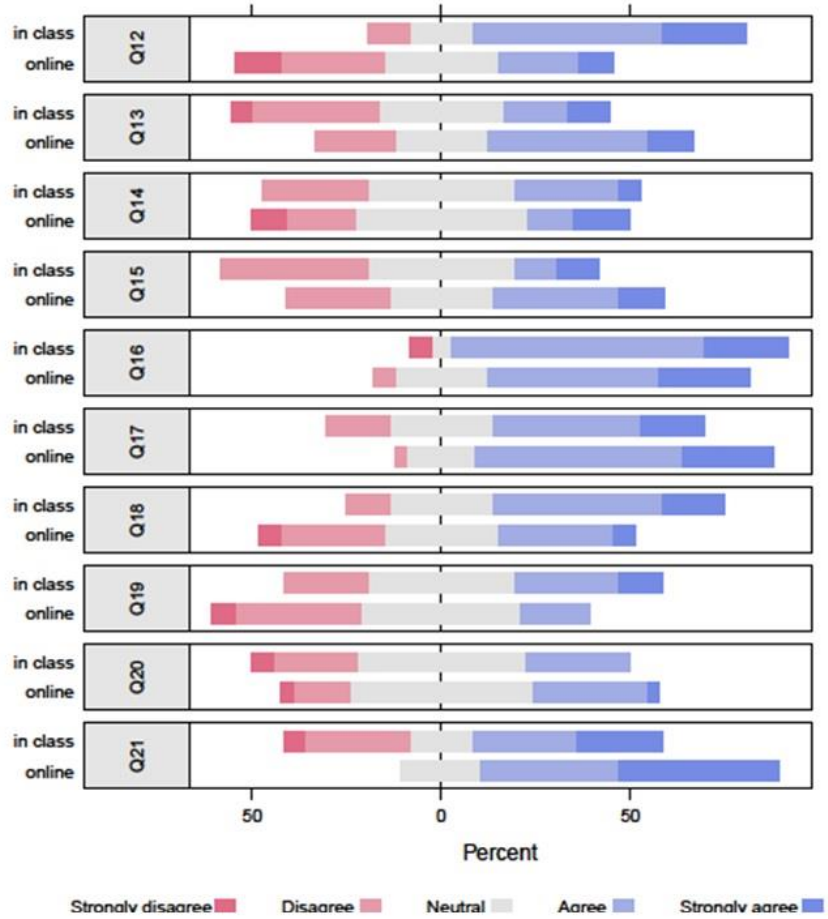
majors, a greater proportion also agreed that the impact of a presentation they experienced was independent of the mode (Q14).

Distinctions between in-class and online presentations

The study examined whether there were differences in how respondents perceived the two modes of presentation, based on the mode-specific block of survey items Q12-Q21. All students were exposed to both in-class and online presentations, either as presenters or as peer assessors. Every student was required to assess six randomly assigned presentations, comprising both in-class and online presentations.

The distributions of responses to those survey items are shown in

Figure 4.



Code	Item	Code	Item
Having watched both in-class and online presentations, I believe that:		Q16	The mode (online/in-class) I chose would effectively prepare me for communication tasks in future career
Q12/ Q13	In-class (Q12)/online (Q13) presentations made a greater impact on me	Q17/ Q18	In my experience as a peer assessor I found it easy to learn from online (Q17)/in-class (Q18) presentations
Q14	The impact of a presentation on me is not dependent on its mode (online/in-class)	Q19/ Q20	In-class (Q19)/online (Q20) presentation offers scope for higher grades
Q15	The mode (online/in-class) I chose required more preparation than the other mode	Q21	Given the choice of online/in-class mode of presentation, I would make the same choice in future

Figure 4. Summary of responses to mode-related survey items Q12-Q21, categorised by the mode of respondent's presentation: in-class (n = 18) or online (n = 33).

There is little difference between distributions of responses to Q14 (impact is mode-independent), Q16 (prepared for future career) and Q20 (online mode offers better grades). In Q13 (greater

impact of online presentations), Q15 (chosen mode required more preparation), Q17 (easy to learn from online presentations) and Q19 (in-class presentations yield better grades), the differences are too small to be detected by the rank sum test. Significant differences between the two modes were found in responses to Q12 (greater impact of in-class presentations), Q18 (easy to learn from in-class presentations) and Q21 (would choose same mode in future).

Half the respondents claimed that the mode (online/in-class) of a presentation did not affect its impact (Q14). Among those respondents, half of the in-class presenters and half of the online presenters declared that presentations in their chosen mode had a greater impact (Q12/Q13). This appears to be a form of confirmation bias (Nickerson 1998). The responses are summarised in Table 4(a). The majority (72%) of in-class presenters believed that in-class presentations had a greater impact, and a majority (54%) of online presenters believed online presentations had a greater impact. Conversely, less than a third of in-class presenters believed online presentations had a greater impact, while a similar proportion of online presenters judged in-class presentations to produce a greater impact. A strong diagonal response implies a confirmation bias. The rank sum test on responses to Q12 (greater impact of in-class presentations) from in-class and online presenters found a significant difference between the two groups ($W=436$, $\alpha=0.05$, two-tailed, Cliff's $\delta = 0.47$, signifying a medium-sized effect). The effect size in Q13 (greater impact of online presentations) is smaller ($\delta = 0.28$), as expected given the smaller disparity in the second column of Table 4(a).

The presentation topics, although not assessable in the final examination, were intended to provide a learning experience that expanded the scope of the subject's syllabus. It would therefore be useful to assess the effectiveness of learning from the presentations. Although the tools to measure this objectively were not available, we queried the students on their perception of whether they found it "easy" to learn from the presentations (online Q17 or in-class Q18).

(a) *Impact*

	Q12/13	Presentations: In-class	Presentations: Online
Presenters	In-class	72%	28%
	Online	30%	54%

(b) *Ease of learning*

	Q17/18	Presentations: In-class	Presentations: Online
Presenters	In-class	61%	56%
	Online	36%	79%

Table 4. Proportions of the specified group of presenters who agreed or strongly agreed with (a) Q12 (in class)/Q13 (online) on presentation impact, and (b) Q17 (online)/Q18 (in-class) on ease of learning from the presentation. For example, in the top left cell of (a), 72% of in-class presenters considered in-class presentations to have a greater impact.

The responses are summarised in Table 4(b). Of all respondents, 45% found the in-class presentations easy to learn from, and 71% found the online presentations easy to learn from. A confirmation bias is in evidence, with 79% of online presenters and 61% of in-class presenters selecting their chosen mode as easy to learn from. The strongest discrepancy appeared in response to Q18, where 61% of in-class presenters and only 36% of online presenters found in-class

presentations easy to learn from. A statistically significant (W=397, α=0.05, two-tailed) difference was detected between the two groups, with medium effect size (δ = 0.34). One possible reason for the discrepancy is the availability of the playback facility in the online mode (in an open-ended response, a student commented that an online presentation was "easier to peer assess since we were able to re-watch the presentation"). It would be interesting to examine whether self-professed enjoyment in the use of technology (for personal matters Q01 or for learning Q03) correlates with ease of learning from online (Q17) or in-class (Q18) presentations. However, as Figure 2 clearly shows, the distributions of responses to Q01 and Q03 were heavily skewed towards positive responses, making it untenable to test such correlations.

Although three-quarters of respondents believed their presentation task would prepare them for communication tasks in their future careers (Q16), this sentiment was expressed by more in-class presenters (89%) than online presenters (69%). The discrepancy may reflect respondents' perception of their future workplace as requiring primarily face-to-face communication skills. It should be noted that the rank sum test detected no significant difference between the two response distributions as a whole.

One of the criteria students apply in choosing the format of assignment, where such choice is provided, is the perception of the extent of preparation required. Overall, 37% agreed that the presentation mode they chose required more preparation (Q15). When broken into the two groups, only 22% of in-class (compared to 45% of online) presenters agreed with that proposition. Thirty-nine percent of in-class presenters considered online presentations to require as much as, or more, preparation than the in-class presentations. By contrast, just 22% of online presenters deemed the in-class presentations to require as much or more preparation. The trend is towards a perception that online presentations, which may require the use of unfamiliar technologies, were harder to prepare. One open-ended response referred to the in-class presentation as "not as complicated to put together", whereas online presenters commented on the time and effort required to record, edit and synchronise audio and video streams, using generally unfamiliar software (but regarded the skills gained as beneficial). Despite the recognition of a greater effort required to prepare online presentations, one respondent commented that the online mode was "much more relaxing and more organised". The perceptions expressed are presumed to be based on a self-grading of the amount of work the respondent put into the task and either prior experience or second-hand information the students might have gained from colleagues who selected the other mode.

A common consideration for many students is the scope the task offers for high grades. A posteriori, 26% decided that the in-class mode had greater scope (Q19), and somewhat more (31%) decided that the online mode had greater scope (Q20). Interestingly, 39% of in-class presenters believed the in-class mode offered a greater scope, whereas only 18% of online presenters did, indicating a form of confirmation bias. On the other hand, similar proportions of online (33%) and in-class (31%) presenters believed the online presentation offered a greater scope for higher grades. Overall, the responses from the two groups were statistically not significantly different at a 95% confidence level.

Having completed the presentation in their chosen mode, the respondents were asked whether they would make the same choice in the future (Q21). As a proportion of all respondents, 68% agreed and 12% disagreed. Taking into account the choice made in the first place, the data shows a strong asymmetry. None of the online presenters would have changed the mode, while 34% of in-class presenters would. The two groups' responses were found to be significantly different (W=180, α=0.05, two-tailed, δ = 0.40, signifying a medium to large effect). Expressed differently,

63% of all respondents would choose online mode in the future and only 12% would choose the in-class mode (the remaining responses were neutral). The phrasing of the question does not differentiate between an interpretation that the responders conceded making a sub-optimal choice this time around and one where the responders merely wanted a different mode in the future to complement the experience they just had.

Some of the distinctions between modes may not have been captured by the multiple-choice survey items, but appear in responses to open-ended question OQ1 (beneficial aspects) and OQ2 (challenges). Students commented on the technical challenges of online presentations, such as audio-video syncing. Several comments from in-class presenters pointed to the relative difficulty of answering questions from the audience in real time ("peers can ask questions in class and the group presenting has to answer the questions instantly while those who presented online can look for the information from their resources if they do not know the answer") whereas an online presenter found "the asynchronous nature of responding to questions online challenging to deal with". One online presenter summarised: "online presentation is a great way to presenting your topics because it will allow you to present your work in more interactive, fun and creative way".

With the qualifications outlined above, the two modes were equivalent in students' perceptions. However, it should be noted that 45% of all respondents considered in-class presentations to have a greater impact (Q12), 26% believed in-class presentations had greater scope for good grades (Q19) and 45% found it easy to learn from in-class presentations (Q17). Moreover, 89% of in-class presenters saw the assignment as an effective career preparation (Q16). There is therefore a sizable proportion of students comfortable with the in-class mode. In an open-ended response, a student found the flexibility to choose the mode of the presentation to be very beneficial.

Academic performance

The average marks against the criteria listed in Table 2, as well as the weighted total mark, are plotted in Figure 5. Each student assessed two in-class presentations and four online presentations, generating, on average, 17 peer assessments per presentation.

For each criterion in Table 2, no significant differences were detected between teams that presented in class and online. The same conclusion pertained to the total team mark, which was a weighted sum of marks for the specified criteria (t = -1.2, df = 13, p = 0.25). The mean and standard error of the weighted total marks for in-class presentations were 70.6±2.4, against 73.8±1.1 for online presentations. Thus, despite misgivings indicated by a minority of survey respondents (that in-class (Q19) or online (Q20) mode might yield better marks), there appeared to be no statistically significant advantage attached to either.

Figure 5 has several notable features. The standard error for the in-class mode is larger than that for online, which could be attributed to the smaller number of in-class teams. The first three criteria (depth of research, structure and digital media), addressed solely by an academic marker, have relatively large dispersions, which is likely due to the discriminating facility not being diluted by averaging over multiple assessors. Although not statistically significant, there is also a consistently higher rating for the online presentations for those three criteria. In fact, on most criteria the mean for the in-class presentations was lower. Therefore, a null hypothesis that the distributions of marks against *all* nine criteria were statistically indistinguishable was also examined. The two sets of data showed significant deviations from normality, prompting an application of the Wilcoxon rank sum test. The null hypothesis could not be rejected (Z =162, p =0.22, at α =0.05, two-tailed). Thus, while the component marks for in-class presentations tended

to be slightly lower than for online presentations, this did not lead to a significant difference in the final marks.

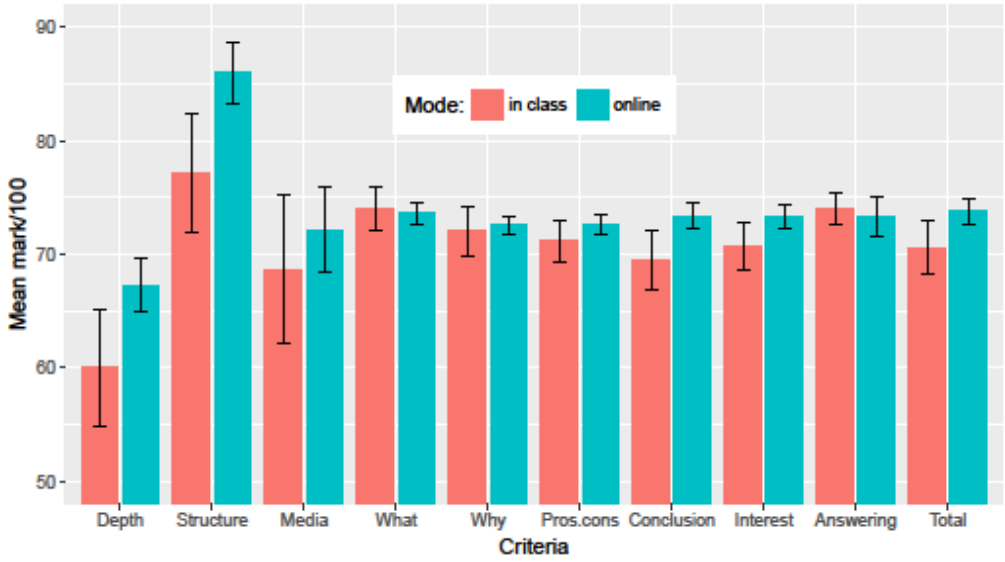


Figure 5. Mean team presentation marks in each of the marking criteria listed in Table 2 as well as the total mark (final column), all grouped by the mode of presentation: online (n = 29 teams) and in-class (n = 10 teams). The error bars represent the standard error in the mean. The total mark is a weighted sum of the marks for individual criteria, as specified in Table 2.

The total team marks were also compared against those obtained by teams in the preceding year when all the presentations were in-class. This was done to test whether introducing online presentations had a significant overall effect on marks. The t-test showed that the means for all presentations (74.1±1.1 in 2015 with n=36, and 73.0±1.1 in 2016 with n=39) were not significantly different at the 0.05 significance level.

Conclusions

The setup in this study allowed us to compare student perceptions of online and in-class presentation modes and respective academic performance in the same cohort. The student survey probed attitudes to digital technology, perceived benefits of the task in terms of graduate attributes such as communication, teamwork and research skills, presentation anxiety and relative advantages and disadvantages of the two modes.

Irrespective of the mode chosen, the respondents viewed the task in a positive light, with about 70% to 75% indicating that it helped them develop the relevant skills and affirming strong engagement with the selected presentation topic. The choice of presentation mode was influenced by gender, ESL status and study major, with the group of online presenters being predominantly female and majoring in medical science, and with a disproportionate participation of ESL students. Gender and ESL status have been reported as factors in the incidence of presentation anxiety. In this study, the gender factor appears to have been reversed (with a higher proportion of males

reporting anxiety), and ESL status is not a significant factor; both findings are consistent with students choosing the online presentation mode to minimise anxiety.

There is little that differentiates responses to the survey according to the chosen presentation mode. Where significant differences occurred, most have been demonstrated to arise from a form of confirmation bias. A strong asymmetry appeared where students were asked to forecast a choice of presentation mode in the future. Five times as many students chose the online mode as chose the in-class mode. It appears that the exposure to both modes of presentation engendered a strong preference towards the online mode.

Despite concerns on the part of some students, there appeared to be no significant advantage accruing to the marks received in either mode. Nor was there any significant change when online presentations were first introduced in this subject. The two modes of presentation were found to be indistinguishable (at the 0.05 significance level) in terms of the team marks. The marking rubric effectively provides an opportunity for the students to self-assess their understanding of the presented topic. Further work is required to assess whether a more objective test of the audience's understanding offers a superior characterisation of the presentation's efficacy.

The student survey found a predisposition towards one mode or the other based on age and gender, command of English, confidence and enjoyment in the use of technology. Although each team prepared a presentation in its chosen mode, all students experienced presentations in both modes in their role as peer assessors. A measure of confirmation bias was discerned in how students perceived the impact of, and ease of learning from, presentations. When asked if they would choose the same mode in the future, all online presenters concurred, while a third of in-class presenters would change. There was little to suggest that online presentations provided an inferior experience for the students, and there is some evidence that the online mode better met the aspirations of many of them.

Within the limitations of the instruments employed, the two modes of presentation have been shown to be essentially equivalent, with the presentation experience predisposing the students towards the online mode. Nevertheless, a significant proportion of respondents were comfortable with the in-class format. This is in agreement with the finding by Woodcock (2012) that while most students "preferred doing video presentations, a few deliberately pointed out that they should not replace oral presentations". Clearly, in-class presentations can serve a number of useful functions not available in the online mode. Real-time, face-to-face (possibly via a tele-link) interactions remain an important form of communication in today's workplaces. Being able to construct answers to questions in real time is also a valuable attribute. Although it is feasible to arrange webinar-style real-time interactions online, the logistics are constraining, and it would remove one of the important advantages of online interactions: the students' freedom to choose the time when they contribute to the interaction. Further study is needed to elucidate the differences between the modes in the nature and quality of post-presentation interactions. Despite the similarity of student perceptions of the two modes, the author does not recommend replacing all in-class presentations with their online equivalents. Ideally, students will participate in both modes of presentation in their courses, with the in-class mode being particularly valuable where the depth and quality of interaction is deemed an important educational goal.

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