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Transitioning Oral Presentations Online in Large-Enrollment Capstone Design Courses Increases Panelist Participation

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ABSTRACT

The UF MAE program delivers a large-enrollment capstone design sequence that traditionally hosts in-person oral presentations with industry panels. COVID-19 necessitated presentations be conducted online. This transition increased average panelist participation by 50%. Average design team scores fell from 92.4% (σ = 5.6%) for in-person presentations in Fall 2017, 2018, and 2019 to 76.9% (σ = 7.8%) for online presentations in Spring 2020. This aberration was not caused by 1) larger / more diverse panels, 2) evaluator fatigue, 3) over-scripted presentations, or 4) difficulty transitioning online. Pandemic-induced stress was the likely cause. Industry sponsor feedback and increased participation compel continuation of capstone oral online presentations when in-person instruction resumes.

Key words: Capstone, Large Enrollment, Online Presentation

INTRODUCTION

The University of Florida (UF) Mechanical & Aerospace Engineering (MAE) Department delivers a two-semester undergraduate capstone design sequence tailored for large enrollment (Traum, Niemi, Griffis, et al 2020; Niemi, Griffis, et al 2020; Traum, Niemi, Collins, et al 2020; Traum, Niemi, et al 2020). Culminating first semester deliverables include a formal oral presentation where groups

provide an overview of their designs to an expert panel. Panelists provide technical and professional feedback akin to an engineering design review in industry.

Historically, oral capstone presentations were conducted in-person. However, with the onset of COVID-19, UF transitioned to all-online instruction effective March 16th, 2020. To preserve this critical feedback and assessment mechanism, oral final presentations were transitioned fully online using Canvas for scheduling, a WordPress website for coordination and archiving, Zoom for synchronous video conferencing, and YouTube for asynchronous content delivery.

To our knowledge, no published literature reports online presentation of final capstone design projects. Wyard-Scott (2010) and Panchal & Starkey (2014) utilized online communication and management tools for capstone courses, but the online medium was not used for final oral presentations. ABET-EAC accredited undergraduate engineering programs offered online (Arizona State University, Stony Brook University, and University of North Dakota) likely conducted Web-based capstone oral presentations prior to the COVID-19 pandemic, but these activities are not reported. Howe and Goldberg (2015) provide a comprehensive review of current capstone instruction practices, and they do not mention online presentation delivery.

Given the paucity of capstone online oral presentation assessment data, this paper compares presentation panel participation and resulting student scores between the online delivery format of Spring 2020 and in-person presentations conducted in Fall 2019, Fall 2018, and Fall 2017. An unexpected aberration arose from the all-online oral presentations: scores were a full standard deviation lower for the online cohort than previous in-person classes. Comparative data analysis eliminates panel size/diversity, evaluator fatigue, and student scripting as aberration explanations.

METHODS

Spring 2020 oral design review presentations were conducted virtually through Zoom. Oral presentations were evaluated by panelists based on fulfillment of ABET (1–7) criteria (ABET 2020), fulfillment of customer requirements, competence in answering reviewer questions, and quality of presentation.

The number and affiliations (industry sponsor, customer, or academic teaching team) of panelists attending each oral presentation were noted in Spring 2020 to provide direct, quantitative comparison against similar participation data collected from in-person oral presentations from Fall 2019. Comparison was also made between the composite scores returned from both the online and in-person panels for oral presentations across 4 semesters.

Table 1. Average capstone oral presentation participation by panelist type. The non-integer total for Spring arose 2020 because various panels contained different numbers of panelists.

Semester	Industry	Customer	Academic	Total
Fall 2019 (In-Person)	4	0	2	6
Spring 2020 (Online)	4.22	2.22	2.65	9.09

PRELIMINARY RESULTS

Transition online increased oral presentation panelist accessibility and involvement to the highest level in UF MAE Department institutional memory. Table 1 shows the number and affiliations of panelists scoring the capstone design final oral presentations both in the Spring 2020 online and the Fall 2019 in-person sessions. A full attendance breakdown for Spring 2020 by session is given in the appendix. Fall 2018 and Fall 2017 panelist attendance data were not kept.

Given large MAE capstone enrollments (~150 students/semester), in-person oral design reviews require two full days. Including two capstone teaching team instructors, 2019 in-person design reviews had the same 6 panelists attend all 25 presentations. By contrast, 2020 online presentations were attended by 21 unique panelists with an average of 9.09 evaluators per group, a 50% increase from the previous semester. For every online presentation, the number of evaluating panelists matched or exceeded those of the in-person sessions. Students in the online sessions benefitted by having more diverse audiences providing feedback while panelists benefitted from a smaller time commitment, no travel requirement, and the opportunity to take regular breaks.

Compared to the average in-person class score of 89.7% (σ = 5.4%) in Fall 2017, 96.0% (σ = 4.3%) in Fall 2018, and 91.9% (σ = 5.2%) in Fall 2019; the average class score was 76.9% (σ = 7.8%) for the Spring 2020 online presentations. Score distributions by semester are shown in Figure 1.

Multiple hypotheses might explain the observed online oral presentation grade aberration in Spring 2020. Engagement of a larger and more diverse panelist population was hypothesized to induce higher rates of criticism. This idea was tested by comparing scoring from the 6 panelists who attended both the Fall 2019 and Spring 2020 sessions. As seen in Table 2, average scores of these 6 returning panelists were only 0.9% lower than the average of all 21 Spring 2020 panelists. Additionally, the standard deviation for the six returning panelists (σ = 7.7%) was only 0.1% lower than for the overall Spring 2020 panel (σ = 7.8%), indicating similar score consistency regardless of previous participation. Greater panel diversity was therefore not the source of lower scores for online presentations.

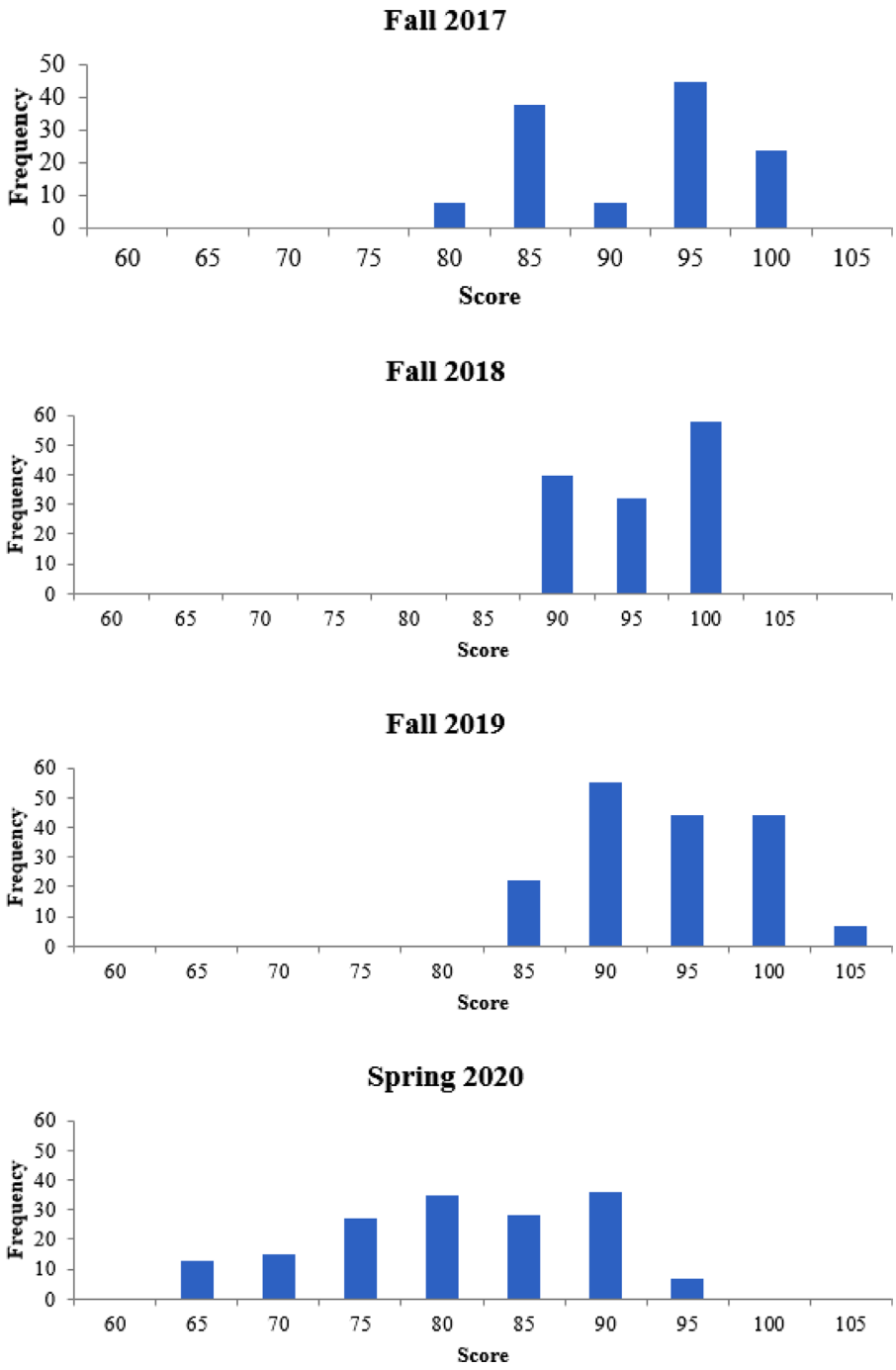

Figure 1. Scoring distribution of oral design presentations by semester.

Table 2. Average and standard deviation values of oral presentation scores across four semesters.

Grade Distribution across Semesters		
Semester	**Average Score**	**Standard Deviation**
Fall 2017 (In-Person)	89.7%	5.5%
Fall 2018 (In-Person)	96.0%	4.3%
Fall 2019 (In-Person)	91.9%	5.2%
Three-Semester In-Person Composite	92.4%	5.6%
Spring 2020 (Online)	76.9%	7.8%
Spring 2020, Original 6 Panelists	76.0%	7.7%

Higher standard deviation in scores for online (σ = 7.8%) versus in-person (σ = 5.6%) presentation motivated the hypothesis that reduced panelist fatigue and time commitment led to lower scores: rested panelists pay closer attention, think critically about what students are presenting, and discover errors. This hypothesis was unsupported by the data because there were no statistical trends when comparing panelists scoring many groups versus those scoring few groups, as shown in Table 3.

Another hypothesis predicted students overused scripted and monotonic presentations due to the online platform. These presentations should score lower on assessment metrics linked to ABET Outcome 3 "an ability to communicate effectively with a range of audiences" (ABET 2020). Removing this metric from the scoring rubric actually raised the average oral presentation score (although insignificantly) from 76.9% to 77.3%, which indicates this hypothesis is also incorrect.

Another hypothesis is poor student performance arose from difficulty transitioning to all-online instruction. It is possible students learning remotely did not have the same motivation levels that

Table 3. Average and standard deviation of oral scoring by panelists scoring a low number of groups versus a high number of groups. High number of groups inspected at both >6 and >9.

Average Score Based on Number of Groups Graded		
Number of Groups Scored	**Average (out of 35)**	**Standard Deviation**
6 or below	26.14	2.79
above 6	28.01	2.37
9 or below	26.83	2.81
above 9	27.54	2.43

exist in person. However, past studies of engineering lab-based courses found that remote classes are more effective than traditional brick-and-mortar experiences (Corter, et al, 2007; Corter, et al, 2011). Additionally, the online environment gave students significantly increased access to one-on-one time with their teaching assistants, design clients, and professors in comparison to in-person peers, minimizing the effect of limited opportunities for in-class participation. Therefore, the hypothesis that stress of online transition explains lower scores is unsupported.

Added stress from the global pandemic is another hypothesis to explain lower online scores. Certainly, students participating in the Spring 2020 semester were subject to previously unknown stresses associated with producing a design project from a remote location. The COVID-19 pandemic was shown to have significant psychological impacts during its initial stages with fear and stress induced over concerns for family wellbeing and elongated durations spent at home (Wang, et al 2020). However, a means of directly assessing impact of these hypothesized effects was not available from the data collected.

NEXT STEPS

In conclusion, lower capstone design oral presentation scores in the Spring 2020 online forum are not due to 1) increased panel size/diversity, 2) evaluator fatigue, 3) over-scripting online presentations, or 4) difficulty transitioning to online education. Lower scores might be attributed to student stresses induced by the global pandemic, but there is no means to test this hypothesis from available data.

Positive feedback from industry participants and increased panelist engagement in Spring 2020 prove compelling to integrate online presentations into all future UF MAE capstone courses. When COVID-19 restrictions are lifted, students and faculty will be present in-person with the meeting simultaneously broadcast online to remote panelists.

An unanticipated benefit arising from establishment of team webpages for online presentation coordination is creation of permanent online archives displaying student work. For the rest of their professional careers, UF MAE alumni can point to these archival pages to showcase a major work product.

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APPENDIX

Table 4. Spring 2020 Capstone Oral Presentation Participation Breakdown By Panelist Type.

Group #	Industry	Customer	Academic	Total
1	5	1	4	10
2	6	2	1	9
3	2	3	3	8
4	5	3	3	11
5	4	1	2	7
6	3	2	3	8
7	4	3	4	11
8	6	2	3	11
9	5	2	2	9
10	4	1	1	6
11	5	1	3	9
12	2	3	2	7
13	4	3	3	10
14	3	3	4	10
15	6	1	2	9
16	4	2	2	8
17	3	2	4	9
18	2	3	4	9
19	3	2	3	8
20	2	3	2	7
21	6	2	2	10
22	6	3	2	11
23	7	3	2	12