Professional Presentation Skill Development Process
in a Capstone Design Experience

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Professional skill development is an essential part of a Capstone Design Experience. This paper describes a process for helping students develop presentation skills for use within their capstone course and for future presentations. The process consists of 4 parts: Preparation, Practice, Presentation, and Review. After receiving instruction and guidelines, students prepare and deliver a practice presentation with the TA, their teammates, and members of another 5-person team who provide feedback from an unbiased external perspective. The students incorporate feedback then give their formal presentation during class to their mentors and peers. A review session is held within the next week to assist with continued professional development. Even with class sizes larger than 70, the time required has proven to be both manageable and valuable. In a survey, 98.6% of the class Agreed or Strongly Agreed that the practice presentations are beneficial and helped them adequately prepare for their formal presentation. 92.2% of the students Agreed or Strongly Agreed that this process also helped prepare them for future presentations. The instructor and industry mentors have stated in focus groups that the "worst" presentations have improved significantly, and on average all presentations are of higher quality.

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Introduction

As part of an ABET accreditation process, Ohio University mechanical engineering students are required to complete certain learning outcomes at a mastery level. The ability to prepare for and deliver an oral presentation with an engineering focus in a professional setting is one of the outcomes linked to the "skills to perform in the work environment" objective. Skill development based on experiential learning and reflective practice[1,2,3], and assessment for this outcome is integrated into the ME capstone design experience. With large and growing enrollments (74 students in 2015-16), all learning activities in the capstone are regularly reviewed for continuous improvement to ensure they efficiently use faculty and teaching assistant time, and effectively develop student skills.

There is nothing special about having students make professional presentations in a capstone course, and other studies have tested the effectiveness of debriefing sessions[1], collaboration among peers in professional development[2], and multi-session presentation skill workshops[3]. This paper describes and tests a process that combines presentation development aspects not found in any single study, with an implementation that appears more comprehensive, student-focused and relational than previous research. Feedback and results reviewed to date confirm that the development process is successful in improving students' presentation skills, along with their ability to properly prepare for and constructively review presentations. Although this paper focuses on the development of presentation skills, the students' experience with the skill development process contributes to their achievement of the ABET lifelong learning outcome, and supports their continuing professional development throughout their careers.

Presentation Skill Development Process

The reflective practice process for skill development involves 4 steps: Preparation, Practice, Presentation, and Review. Briefly, the presenter completes a preparation activity, delivers a practice presentation and receives feedback, implements changes, and then delivers the formal presentation in a public setting, often in a design review. Then the presenter completes a self-evaluation based on a recording of their presentation, which is followed by a meeting with the Teaching Assistant (TA) in order to complete the reflective activity. Since this is a mastery outcome, any student whose presentation does not meet the minimum standard set in the rubric must repeat the presentation until they do.

The "Preparation" step was implemented to address an observed lack of preparation on the part of some students which led to low quality presentations. Through discussion we found that many students did not know how to prepare for a formal presentation, so proper preparation was a separate skill that needed development. In the preparation step, teams are provided with presentation resources, a presentation

template, a grading rubric, and links to examples of exceptional presentations from previous years. The presenters read three skill development articles (on topics such as presentation style, effective slides, and organizing a compelling story), then document how they implemented learnings from those readings in their presentation. They are strongly encouraged to work as a team to prepare for the practice presentation.

The "Practice" step helps the students by forcing them to practice in front of others (the TA, their team, and members of other teams). The practice is typically completed at least one week before the formal presentation so the presenters have time to implement changes. During the practice session the content, presentation quality, and presentation style are assessed with a focus on areas for improvement, and presenters are encouraged to make time for more practice runs since we find lack of practice is one of the main issues with presentations that do not meet expectations. The content check ensures that what is presented is technically correct, is relevant for the purpose, and adds value to the presentation. The quality check ensures that individual slides are laid out for effective communication, the introduction and conclusion are strong, the flow of the story is good, and through it all, they clearly communicate their message and fulfill the purpose of the presentation. The presentation style check ensures that the presenter is clear, enthusiastic, professional in appearance and approach, and uses good body orientation, eye contact and hand gestures.

After the practice presentation, there is time for open feedback from the other students, and the instructor or TA concludes by going through the presentation slide-by-slide making suggestions. The use of multiple teams in the practice sessions is a revision implemented last year to give students more exposure to what is expected in a professional presentation, to allow them to learn from observing, and to help them develop the skill of offering constructive criticism to their peers. In addition to verbal feedback, the presenter receives completed grading rubrics from everyone present to include the perspective of those who are not comfortable giving their feedback verbally. Filling out the rubric for others also allows everyone gets more familiar with the expectations for when they are the presenter. Past experience shows that members of the presenting team are less likely to give critical feedback to their teammates due to team dynamics, therefore, other teams play a vital role in the feedback process. Studies of self and peer assessment specifically related to presentation skills[4] and more broadly to experiential learning[5] identify some challenges and effective approaches which are being incorporated into this practice step and the overall skill development process.

The "Presentation" step includes a formal presentation, either in a design review or other public presentation style, to an audience that includes project mentors from industry, faculty, classmates, and others. During the formal presentation, a team member records the presentation, which will later be reviewed by the presenter and used by the TA for grading purposes. After the formal presentation there is a Q&A session to allow reviewers to give useful guidance and feedback for the team project, and to test whether the presenter has sufficient mastery of the content to be able to respond to questions. Additionally, all mentors, students and faculty viewing the presentation fill out assessment rubrics to provide the presenter with helpful feedback. These sheets are gathered, reviewed and given to the presenter to read before the review session.

The "Review" session is the main reflective step in the process and has been a topic of interest of research[1,3,4,5]. Unlike the practice presentation, in the review session the TA meets only with the presenting team. The review session happens about 1 week after the presentation, allowing time for the TA to grade all of the presentations and to provide feedback on the recorded videos of the presentations. The presenters are required to bring four things for the review session: documentation of how they implemented learnings from the presentation skill development readings in their presentation, a self-evaluation of their performance using the rubric (based on watching the video of their presentation), a summary of the feedback they received in the completed assessment rubrics, and a plan for responding to the questions and action items that the reviewers made in response to the presentation. Three questions the TA asks during the review are:

1) What worked for you and the presentation?
2) What did not work for you and the presentation?
3) What will you do differently next time?

These questions often lead to a productive discussion, as the presenters are often their own worst critics. The students are often already aware of the areas where they need improvement, so the TA can focus on how they will overcome those deficiencies and apply the things they learned from this experience in future presentations, encouraging their continued skill development. To develop a sense of accountability and professionalism, action items concerning their project that resulted from the Q&A are then reviewed, and a plan must be established to respond to the project mentors about those actions in a timely manner. They are encouraged to contact the project mentors in attendance at their presentation in order to thank them for their time and input, and to ask them to review their list of action items for completeness and to review the team's plan to address them. This follow-up communication step was implemented to help the students understand the importance of clear communication and following up with supervisors.

Benefits of the skill development process

We have collected a mixture of qualitative, quantitative, and student survey data to determine the value added by this skill development process, and have used that data along with the time requirements to assess whether it is worth the time investment. Value added as used here is assessed based on mentor and instructor feedback and an increase in the grade scale. In the most recent survey data, four questions were asked. 1.) Does this process help prepare you for future presentations; 90.4% of the students Agreed or Strongly Agreed. 2.) Are the practice presentations beneficial and help adequately prepare for the formal presentation; 97.3% Agree or Strongly Agree. 3.) Do the review sessions help understand what could be done to improve or enhance your skills and abilities for future presentations; 81.6% Agree or Strongly Agree. 4.) Do other teams provide helpful feedback in the form of evaluations and suggestions; 85.3% of the students Agree or Strongly Agree.
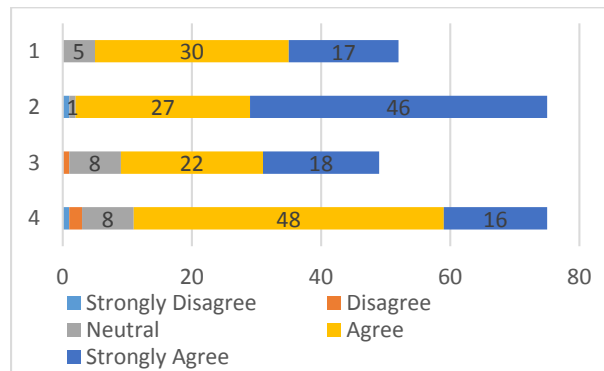

Figure 1: Student Responses to 4 Survey Questions

The main comments from the students completing the survey addressed the usefulness of presenting in front of another team and getting constructive feedback from the Professor or the TA. Additional suggestions were to allow more time between the practice presentation and the formal presentation, and require more practice presentations. All evidence points to strong student support for this process of developing their professional presentation skills.

In response to a question about the optimum number of teams involved in the practice presentation sessions, 88% preferred more than one team, with the majority stating 2 teams was optimal.
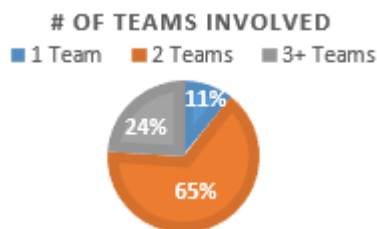

Figure 2: Student Suggested Number of Teams Involved

The industrial advisory board members who serve as project mentors have also commented on the improvements that they have seen in the quality of presentations over the past three years as the development process has become more formalized. The project mentors initially suggested the use of a standard presentation template, since it is an industry practice to allow more effective design reviews across multiple projects. Since most presentation sessions involve about 5 presentations at a time (though it can be up to 15), the template allows the mentors and audience to focus more on the actual content and quality of the presentation and not have to recalibrate to a new format for each team's presentation. Presenters still make many decisions about how to organize an effective presentation, but questions about the formatting, layout and structure are minimized. In a recent focus-group discussion, the project mentors reported that they are very pleased with the use of the templates, stating that it has allowed them to give more useful feedback about the projects. They also reported that they have seen a significant improvement with regards to the quality of the presentations from the baseline two years ago to the presentations completed this year.

The current TA (and co-author) has been involved in the presentation preparation process for the past 3 years, first as a student, then for the past two years as the TA in charge of implementing the presentation skill development process. From the TA's experience, the practice presentations have realized the most immediate benefit to the students. The practice presentations force the students to be prepared and have some, if not all, of the presentation prepared at the time of the practice, and forces them to practice in front of other peers, simulating the formal presentation. Consistent with the experiential learning and reflective practice model mentioned earlier, through the learning stage of the practice presentations several changes and suggestions are made, and the review sessions provide the reflection needed to aid in continued professional development. Based on the TA's perspective as the presentation grader for the last two years and the person most responsible for conducting the practice and review meetings, there has been an improvement in the students' preparation for the practice presentations, enabling more informative feedback for the students.

The use of templates has increased the level of confidence of the presenters and contributed to stronger presentations in the areas of introductions, use of visual aids, and presentation style. Reflecting on all the presentations from the past two years, there is a noticeable increase in quality from this year over last year, as defined by a more clear communication of essential aspects of the projects. The review sessions have also proven useful for students, especially those who are fully engaged. The TA has also seen a drastic

improvement in the quality of the student participation and benefit from the review sessions this year, as compared to previous years.

The instructor has been leading this capstone design experience for 15 years, and has experimented with many professional skill development processes. For example, a performance review style process is used for making the grading process similar to what students will encounter in industry, and within that process there is a focus on taking responsibility for their own skill development. The presentation skill development process is the most successful and the one most embraced by students, likely due to the fact that presentations are more concrete and visible than leadership, interpersonal communication, and the other professional skill development areas. The instructor has not seen a great improvement in the top tier of presentations (there have always been very good presentations by some students), but has seen significant improvement in the middle and lower levels. In other words, the average presentation is significantly better now than before the development process was fully implemented, and the lowest rated presentation in the class after the implementation of the development process is much better that the lowest rated presentations before the development process was implemented.

Value analysis

To help determine if the positive results (including improved presentation skills) justifies the input time and effort for the TA and instructor, the TA reports that it takes a onetime effort of approximately 3-4 hours to prepare all of the needed materials for all the teams for each round of presentations. This time investment yields consistent presentations that allow the students to get more useful feedback from their peers and mentors. The practice presentations take approximately 30 minutes for a 2-team session (for a 7-10 minute presentation) when run efficiently, so compared to the benefits this has been judged to be an effective use of time. The recording of formal presentations allows for consistent grading, allows the opportunity for the students to evaluate themselves, and allows the presentation to be used as example in future years. This time is put in by the students, and the payback makes it worth continuing. The preparation for the review sessions is the most time consuming part for the TA at approximately 30 minutes per team. This includes watching the video, writing an evaluation of the presentation, and grading the presentation. The students spend between 0.5-1.5 hours preparing the required material for the review meeting, which lasts 15 minutes. Since this step has high benefit by providing students with useful feedback to enable continued professional development, the overall value makes the time investment worth continuing.

Suggestions for further work

For continuous improvement, to make students more aware of common mistakes we developed an attention getting "Best and Worst Practices" presentation to demonstrate issues with eye contact, voice projection, body language, effective use of words on slides, and effective use of pictures on slides. The class participated in open discussion to identify and address the errors. The effectiveness of this activity will be assessed in the future, but initial evaluations showed an improvement in these target areas after this example was given to the class. In the future we plan to have students make their own "worst practices" mini presentation as part of their practice session, and use video recording of their best and intentionally worst attempts to make the lessons about presentation style more personal and hopefully more effective. Also, the grading rubrics could also be modified to allow for easier comparison of student performance in specific categories from presentation to presentation, or from year to year. The current rubric is assessment-focused with only a few rating categories (needs improvement, meets expectations, and exceeds expectations), which works well for assessment but more resolution is necessary to track small but meaningful improvements.

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