



Yes, We Teach Presentations Online and It Works: Methods for Teaching Technical Presentations to Practicing Engineers in a Online Environment

Ms. Christine G. Nicometo, University of Wisconsin, Madison

Christine Nicometo is the Program Director for Professional Literacies Courses in the University of Wisconsin-Madison's Department of Engineering Professional Development. She has taught technical communication online for over a decade as a faculty member in the following online programs: Master of Engineering Management; Master of Engineering in Engine Systems; Master of Engineering in Sustainable Systems. Her co-authored book on technical presentations, (*SlideRules: Design, Build, and Archive Technical Presentations in the Engineering and Technical Fields*), was published in 2014 by IEEE-Wiley.

Dr. Traci M Nathans-Kelly, U of Wisconsin-Madison; Cornell University

Traci Nathans-Kelly, PhD, teaches engineering and technical communication at Cornell University and also at the University of Wisconsin-Madison in their respective Colleges of Engineering. Her work allows her to inform the practices of engineers at all levels—from practicing engineers on the job in almost every sector of engineering work to undergraduates readying themselves for job demands. Sponsored by the IEEE Professional Communication Society, she is the series editor of the Wiley-IEEE Press line titled "Engineering Professional Communication," where she helps engineers and communicators alike bring their ideas to wider audiences, both academic and professional. She gives workshops on various engineering communication topics to audiences in the professional and academic realms alike. Nathans-Kelly was recently part of a National Science Foundation grant studying the alignment of engineering education with practice.

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Abstract

We have been teaching technical and engineering communication in a graduate-level online course for over eight years. As part of that work, we advise the students (all are practicing professional engineers) about writing and presenting alike. In fact, the presentations element of the course is unilaterally the most lauded element of that course. However, again and again, instructors interested in teaching presentations online ask us, “How can you do that? How can presentations be taught online?” Our answer is both a complicated one and a simple one: you must have the right setup, the right infrastructure, and a thorough understanding of the students’ milieu and motivation.

Lacking the benefit of being able to constantly model presentation techniques in a face-to-face arena for our students, we engage them through a variety of other pedagogical methods and teaching strategies. In addition, because we are constrained by our lack of physical modeling (outside of video, which also has its limits), we have essentially flipped the presentation classroom to have the students do the “real” work of their presentations in their actual engineering workplaces. From small practice exercises (elevator talks) to long on-site and high-stakes presentations, participants come to develop a deep understanding their of audience and goals. There are many moving parts to consider for such work on our part, such as platforms, issues concerning proprietary information, face time, feedback mechanisms, and personal style.

There is ample evidence of the success of our model from both student self-reports as well as employer evaluations and feedback. Furthermore, this model is scalable to other graduate technical and professional communication courses. This paper shares techniques we have deployed to achieve success in teaching behind a screen and share best practices for others who use presentations as a means of fostering and evaluating student learning via distributed learning platforms.

Introduction

WebEx. GoToMeeting. Blackboard. Skype. Google Hangouts. TeamViewer. There is no shortage of programs that can support online courses that ask students to do talks, and the ones listed here are some of the most popular for presentations and meetings. With globally-dispersed teams in academia and industry, we believe that online meetings are a reality for all and must be addressed in our engineering communication courses and discussions.

We have been teaching technical and engineering communication in a graduate-level online course at the University of Wisconsin-Madison for over ten years. As part of that

class, we advise our students (all are practicing professional engineers working all around the globe) about writing and presenting alike. In fact, the presentations component of the course is touted by the students, year after year, as the most influential factor of the course. Our graduate student/practicing engineers tell us again and again that they were promoted or recognized inside their organizations for their new presentation skills. The techniques we teach have been proven to work for on-site engineering talks, client-facing meetings, in-house training, and other presentation settings. These techniques are thoroughly documented¹⁻².

In this paper, we describe how we do what we do--the nuts and bolts of the course design and delivery. Because our students are practicing engineers, our course (part of the Master of Engineering Management program) is necessarily online, as the engineers are working in locations around the U.S. and the globe. And, yes, we teach presentations via online delivery.

But when we talk about these successes with other instructors, we are often met with doubt. They ask us, "How can you do that? How can presentations be taught online?" Our answer is both a complicated one and a simple one: you need to start with thorough understanding of the students' milieu and motivation, you must have the right setup, and the right infrastructure is at the core of success. The key is thoughtful dynamics, on both sides of the screens.

Our course process: One example of many ways

Lacking the benefit of being able to constantly model presentation techniques in a face-to-face arena for our online students, we engage them through a variety of other pedagogical methods and teaching strategies. In addition, because we are constrained by our lack of physical modeling seen face-to-face (f2f), we have essentially flipped the presentation classroom to have the students do the "real" work of their presentations in their actual engineering workplaces.

From small practice exercises (elevator talks) to longer on-site and high-stakes presentations, participants study their deep understandings of audience, level, targets, goals, and audience control. There are many moving parts to consider for such work on our part, such as platforms, issues concerning proprietary information, face time, feedback mechanisms, and the like; these we will share and discuss herein.

Indeed, we are fortunate to have worked with a hardworking team of people and with a Program Director who maintains a vision that builds on methods which maximize the experience for student and teacher alike. Our course is a part of a larger Masters of Engineering Management program, and it is required as part of each student cohort's planned sequence of classes delivered online. We have about 30 students in the course each spring semester. These students move through the program in a cohort model, allowing them to grow together and feel quite comfortable sharing experiences and giving critiques. The cohort model, combined with the inherent motivation of adult students to get the most out of their learning experience, definitely contributes to our ability to teach presentations online so successfully.

To reach students asynchronously, our program uses a tailored Moodle® platform supplemented with Box® for moving documents back and forth. For synchronous, weekly interactive seminars, we use the Blackboard® webconference platform.

Moodle is used as the home-base for the course, housing the course overview, all assignments, all grading rubrics, all asynchronous discussion forums, schedules, due dates, and other learning activities. All assignments, forums, grading rubrics, and resources are available the first day of class via Moodle. Ensuring that these extraneous items are structured clearly from the start of the class also helps students feel supported and allows them to work their schedules around class expectations well ahead of time.

Students are also reassured that their work is secure and that they can be confident in questions of proprietary information since we use a secure system for document management. Box, secured via our university system, is the document management system our program uses to submit and return feedback. An easy link to Box is found on our course Moodle page. Because of potential problems with the security of email, we avoid transferring files by email as much as possible.

The current platform for our twice-weekly live webinars is Blackboard. It can be accessed from our Moodle page hub. It requires updated Java to function and once everyone is familiar with its functionality, it works well, adding many of the pedagogical methods that we might use in a classroom environment to our toolkit. For instance, students have the ability to either add comments during a presentation via the live chat window or to raise their hands to be called on by the instructor. As instructors, we can share slides and mark them up in the moment, with students adding in comments, polls, or other active feedback for the group to discuss. The combination of prepared discussion/lecture slides with the growing use of backchannel communications via chat and other tools, allows the online webinar experience to be even richer than most in-seat experiences students might have in a classroom. Also, because Blackboard live sessions can be recorded for archiving purposes, when students have to miss a session, they can easily retrieve and view the recording to catch up on what they missed.

The entire degree program is online, with one exception. We encourage every student to come for summer residency, which is one week each late summer. As a program, our leadership determined from the outset in 2001 that knowing each other, in a face-to-face (f2f) setting, would be the key to success. Indeed, recent studies have backed up what our leadership discerned in those early days--that the best work is done when humans have made initial contact in f2f contexts.

As it applies to the class task of presentations, having some personal contact with invested parties makes the sometimes rather frightening prospect of honing presentation skills more comfortable. Throughout the semester, our online forums allow for discussions about techniques, strategies, approaches, and issues about presenting technical information inside complex organizations worldwide. The trust that is built by knowing someone in a f2f context is invaluable for the course.

Student trust in the system and the course is also built on the knowledge that they will have a stable and seamless learning experience online. Our departmental learning technology team has always been heavily involved in evaluating the program's needs and solving issues that students may have with connectivity, firewalls, and the many-headed hydra that is technology. Over the years, we have used several platforms for the course and for webinars and have enjoyed the support of our fantastic team of experts to guide us through the new tools and ensure students have a quality learning environment for our course. Because students have had the opportunity to meet the support team at residency, they are also more likely to reach out to them with problems as needed.

The learning technology team has also helped us work through some pedagogical questions and needs in the course. For instance, to work with people on their presentation skills in an online session, we need two functionalities: the ability to hear them and the ability to see their slides (when needed) live. Certainly, the teaching team has discussed whether we need to see the students via streaming video for their talks and interactions. However, working with the learning technology team, we found that live video or streaming is not reliable enough due to the wide locations of our participants. Over the years, we have had people connecting from remote fields, small rural towns, the middle of Africa, and the suburbs of Shanghai. Truly, video streaming is a detriment in these moments (as of this writing) because of poor (or no) connections. So we stick with what works: audio, slides, and the active functionalities our meeting platform can provide.

The basic course cycle: Overview

Over the normal 16-week semester, these graduate engineering students have much to accomplish in our course. Not only are presentations part of the core mission, but so is an in-depth written deliverable to their companies that demonstrates thorough research on a problem at their workplaces. The presentation is part of that final deliverable set that is both for company use and for their academic credit. We require students to video record these presentations for self-review (some exceptions are granted here when workplace security protocols prohibit recording).

At the start of the term, the brainstorming and investigation of a topic pertinent to their work and technical leadership helps them begin to build worksite alliances and buy-in for this research early on. We prepare students for these early conversations with readings and discussions on the art and science of persuasion. This foundation is critical for them to convince others that their topics and research questions are important and to get buy-in from influential stakeholders in their organizations. Once the topic is set, the graduate student-professionals begin their research and writing for the course. In brief, the course is broken into the following topical progression:

- Weeks 1-3: topic determined, schedule proposed, research issues addressed
- Week 4: the art and science of persuasion
- Weeks 5-6: effective presentation techniques, slide design for technical work
- Midterm: begin to secure audience members, room, permissions to record
- Weeks 11-14: students give their talks at work

- Weeks 14-16: meta-reviews of work talks (two online sessions per week, with about seven students talking per session)

The basic presentation cycle: From thoughts to talk

Very early in the term, we ask them to identify potential audience members for their final presentation at their worksite. This is key, because their colleagues are incredibly busy and have deadlines that shift constantly. Once they determine who needs to be present for their at-work presentation, they can begin to build excitement and ferret out expectations from their identified worksite audience members. Creating this network and addressing their expectations is the basic tenet of *know your audience*. For these professional engineers, knowing their audience is far more complex because the audience is not a self-contained, safe classroom. The stakes are higher, all around.

We expect that by about mid-semester, students should have the nuts-and-bolts of their worksite presentation settled: the date, the time, the place, the video camera, and the roster of attendees. Part of the rich feedback provided in the course is the ability for students to view a recording of themselves giving a talk. Like many other instructors and trainers over the last decades, we have found that when people see a video of their performance, a much better sense of strengths and weaknesses can be identified by the participants themselves. Doing this type of self-assessment is an incredible learning experience, especially since most of our students have never seen themselves on camera in a professional context.

Getting permission for the recording to occur in certain workplaces can involve some bureaucratic logistics, and we have seen students through any of the following scenarios in the context of their work policies:

- recording is acceptable
- recording is acceptable and can be widely dispersed (no proprietary concerns at all)
- recording is acceptable if it never leaves the building
- recording is acceptable if performed by an in-house PR person
- only audio can be recorded
- only still photos can be captured
- no recording under any circumstances

Of course, some of the engineers have to give their talks online to their colleagues and/or clients. Using everything from in-house services to WebEx, they give their talks to people in the room and others via a conference bridge or web client. If possible, we ask for a video to be made of that talk; sometimes, a recording of screen+audio is the only thing available to them for their own self-assessment.

Fortunately, no matter the recording policy they are working with, we also require the audience members to provide feedback to the presenters. To standardize feedback, we provide a template for students to distribute to their audience members. This form can be customized by students with additional questions, but we have found that having a standard form helps students compare and benchmark among their peers in other

workplaces and industries. Students then use the feedback from their audience members as part of their meta-analysis of their presentation performance.

An important aspect of the presentation recording is that students do not need to give the video to the instructors. That video/recording is for the students alone for self-review purposes. Letting the recording stay in the hands of the engineer and her/his company circumvents many issues that would otherwise come up with proprietary concerns, non-disclosure agreements, and so forth. Students are required to review that video, and then give a follow-up presentation, for the instructors and cohort members, given in a live webconference session.

In early iterations of the course, the video recordings were sent to the instructors for an additional point of feedback; however, since we cut the instructor-viewing out of the requirements, we have found that student self-reviews paired with audience feedback seems to provide just as specific performance analysis and assessment as what we were able to provide by viewing the videos. In fact, because we no longer have the proprietary headaches and delays to deal with, students are able to get a more real-time picture of their performance to better enact immediate change.

For their assessment presentations, participants are required to address the following items as well as any others they may wish to comment on:

- Topical overview
- Audience members
- Positives of the talk
- Elements to work on for future talks
- Outcomes of the talk
- Next steps for personal presentation improvement

This structure allows students to not only perform a careful analysis of their own performance, but also to compare and contrast others' experiences with audience and purpose during the presentations of their peers, all of whom present technical topics in a variety of engineering organizations. In this way, students are able to norm their experience with benchmark professionals in their own and other industries. In student self-reports, this norming process plays an integral role in helping them feel more comfortable with presenting and more confident in their own presentation abilities.

Understanding the students' milieu and motivation

Engineering presentations are typically complex combinations of facts and data (*logos*), credibility-building (*ethos*), and persuasion (*pathos*), housed in a milieu that demands the speaker understand the big picture (*kairos*). Speakers need to be comfortable and assured in their data, they need to communicate precisely and efficiently without being scant, and they must be masterful with their persuasive moves to convince often reticent audiences to accept their new ideas or proposed projects.

The groundwork for teaching presentations in any online course must be carefully constructed; critical questions about the pedagogical reasons for including student

presentations are important to consider before integrating them into a course. In this respect, those of us teaching in engineering schools have it a bit easier. Engineers are frequently required to give presentations as a regular part of their jobs. Sadly, while many presentations are assigned at the university undergraduate level, students are given too few chances to really hone this skill. Presentations are often assigned, but rarely are best practices covered in class by their engineering professors. In addition, at most universities, undergraduates give talks about extremely technical topics, which is often not the purpose of the presentations they will be asked to give in their careers.

Once on the job, presentations and/or talks during meetings are a mainstay of information transfer inside technical organizations. As well, most of the presentation training we see, purchased and touted by engineering and technical organizations, does little more than perpetuate bad habits and myths about presentations. Too often, the advice given is more for marketers or sales, and it fails when applied to engineering work⁴.

Thus, for our purposes, we had to understand as fully as possible why engineers gave presentations at work, what were the perceived shortcomings, and why talks failed to hit their mark at times. As students gain the ability to analyze their own work audiences, they become much more aware of what those audiences need and of where they may have missed the mark in past presentations, as well. For example, one of our students, who works for a major heavy equipment manufacturer, analyzed his audience and context in the following way:

“The audience will be cross-functional and potentially involve multiple regions (depending on the project). My experience on presenting to these teams in the past has helped me understand that they want high-level information. They expect the messages to be crisp and concise. They do not want, nor need, detailed technical explanation. Rather, they want to ensure critical issues are addressed in order to provide high confidence that we can achieve the stated financial and business outcomes. A mentor of mine once said that he trusts his teams to do the detailed work. When he has teams presenting to him, he is often looking more for passion for the concept than actual details. This will be critical in my presentation.”

Along with inquiry and discussion, we also began to keep some statistics that became very interesting, as the answers stay steady within 1-2% each year (see Table 1).

<i>Table 1. Practicing engineers (our graduate students) answer in the affirmative to these pre-course questions about their workplace presentation practices. N=158. Years 2010-2015.</i>	
<i>Question</i>	<i>Affirmative</i>
Give presentations 1-5 times a month	93%
Use slides as visual aids to make technical points	90%
Use slide decks as archival pieces for internal or external use	45%

Understanding where and when engineering talks are given was/is a key component to knowing how to craft our approach. If you are teaching undergraduates, then it is essential to understand, even infiltrate, the engineering presentation courses on campus. This will influence your decisions on how to prepare your online course materials. If you are going to teach alternative methods than those traditionally seen by the professors¹, then the professors need to be aware of the new approach. If you are instructing undergraduates who are out on co-op or internships, then part of the task is to understand the current culture and expectations of those on-site talks, as expectations and traditions vary greatly between organizations.

Our graduate students are in a specific professional context and we strive in our course to meet them in that place. The pedagogical choices we have made in teaching presentations to these students are born directly from the context in which our students must function. We believe that this same approach can be extended to other audiences online as well.

Conclusions: Evidence of success

For a presentations course to work, we believe that there must be a carefully vetted mix of student buy-in and dedication (to each other and to their own professional development), active daily engagement (asynchronous-only methods are less successful), and technologies with sufficient support teams to troubleshoot issues. We might add that we have found that team-teaching this course is a true benefit, especially when schedules clash or technologies glitch for one instructor or the other. Being able to seamlessly tag-team responsibilities in a moment's notice allows our credibility as online instructors to remain high.

We know that this course is meeting our students' and their employers' needs based on the final course evaluations, graduate exit survey data (from the MEM program, where our course consistently is ranked first or second in response to "How important is this course to the curriculum"), alumni interviews, and countless anecdotal emails, phone calls, and other follow up contacts we have with students after they complete the course (See Table 2).

Table 2. Self-reported success or anticipated success from lessons learned in the Communicating Technical Information course. An entire set of course evaluation questions are answered by students, anonymously, at the end of the course. With approximately 30 students per term, we are excited each year that the success rate increases (mean out of 5.00).				
Course	Term	Year	Useful in current responsibilities or job	Useful in future responsibilities or job

CTI	Fall	2000	4.36	4.21
CTI	Fall	2001	4.60	4.60
CTI	Spring	2002	4.52	4.56
CTI	Spring	2003	4.52	4.38
CTI	Spring	2004	4.12	4.36
CTI	Spring	2005	4.31	4.38
CTI	Spring	2006	3.79	4.05
CTI	Spring	2007	4.13	4.21
CTI	Spring	2008	4.32	4.43
CTI	Spring	2009	4.30	4.50
CTI	Spring	2010	4.73	4.81
CTI	Spring	2012	4.72	4.88
CTI	Spring	2013	4.73	4.89
CTI	Spring	2014	4.69	4.78

Anecdotally, on the day of this final rewriting, we received the following note from a student in our course which is fairly representative of student and employer responses:

“This morning, I had to present something that is not related to my [course] project. But, I used some of the presentation techniques we are studying.

I had a compliment email waiting when I got back to my desk...

Thanks,
A.”

Motivating students, undergraduate or graduate, is always a challenging enterprise. Yet, as we learn more about the intrinsic and extrinsic motivators that our students are experiencing in context, we can get a better sense of the strategies and structure in our courses that will prepare them best for success. Like them, we need to know our audience. For them, we need to have strong pedagogical stances, well founded, and carefully translated to online environments. The essential mix starts with the class content, and the online delivery modes need to fit those needs.

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