

AC 2009-669: ENHANCING THE ORAL-PRESENTATION SKILLS OF ENGINEERING STUDENTS: TECHNOLOGY TO THE RESCUE WITH THE VIRTUAL-I PRESENTER (VIP)

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Enhancing oral presentation skills of engineering students: Technology to the rescue with the *Virtual-i Presenter (ViP)*

Abstract

Engineering graduates are faced with solving increasingly interdisciplinary and complex technical problems in a competitive world that requires clear communication and presentation skills. To this effect, oral communication skills should be considered an integral part of an engineer's formal education. Many engineering departments, however, are currently experiencing a growth in enrolments which is translating to larger classroom sizes. Unfortunately, this is impacting on the ability for students to acquire oral presentation skills because in-class oral presentations can take over limited lecture or lab time which is needed for other critical technical material. To tackle this problem and improve presentation skills, a program called *Virtual-i Presenter (ViP)* was created. ViP allows students to create, review, and evaluate oral presentations using a webcam and a PowerPoint presentation outside of lecture time and still receive peer and academic feedback. The program has NO video or audio editing capabilities and thus the presentation becomes closer to how live presentations are given. ViP features a system to evaluate presentations, enabling the presenter to receive both technical and presentation skills feedback from peers and lecturers. ViP was successfully tested in classes of 19 natural resources and 78 civil engineering students. Survey results showed that students repeated (practiced) their presentations 4 to 6 times on average before submitting their final one. This is significant because most other students within the department will do less than 3 oral presentations during their academic career. By students being able to "see and hear" themselves present, it made them aware of their oral skills or fallacies and motivated them to enhance presentation skills by practicing more. The survey also showed that student's overall experience with ViP was positive. As commonly as a lecturer currently asks students to write a report, lecturers can now also assign an oral presentation using ViP. Segments of ViP presentations can be discussed in class to highlight good and poor presentation techniques. Since ViP oral presentations are saved in digital format, students can learn from previous years presentations. Live presentations can not and should not be substituted fully; however, ViP enables students to become better prepared for when they have a chance to give a live presentation.

Introduction

Current engineering graduates are faced with solving increasingly interdisciplinary and complex technical problems in a competitive world that requires clear communication and presentation skills. These skills are actively being sought by industry, as can be seen in most engineering job advertisements requiring prospective engineers to have good communication skills. Furthermore, recently updated professional guidelines, such as those provided by the Institute of Professional Engineers New Zealand (IPENZ) and the U.S. Accreditation Board for Engineering and Technology (ABET)^{1,2}, consider these skills an integral part of an engineers formal education. Specifically, the ability to communicate effectively is a professional skill that all engineers should possess as presented in Criterion 3 of the 2003 revised ABET accreditation criteria^{1,2}. Various approaches have been taken¹ by universities to provide opportunities for students to improve written communication skills, but improving student oral presentation skills

remains a significant challenge. Although there is much debate on how oral presentation skills can be taught to students, it is generally agreed that these skills can best be improved through practice and feedback of oral presentations.

University engineering educators often struggle to provide students with enough opportunities to help them improve their oral presentation skills. Two key issues in preventing educators from giving students opportunities to practice oral presentations are class sizes and the need to cover critical ever increasing technical material. Administrative and economic challenges, together with an increasing number of students interested in engineering disciplines, have often translated to larger classroom sizes at many universities. For example, in the department of Civil and Natural Resources engineering at the University of Canterbury, student numbers for each class in the first 3 years surpass 160. Given these large numbers and a tight curriculum focused on technical material, lecturers are usually not able (or willing) to allocate lecture, tutorial, or lab time for individual students or even groups of students to deliver oral presentations. In the final year, students are supposed to have more opportunities to improve their professional skills; however, with some class numbers surpassing 75 students, it is becoming impractical to allocate time for oral presentations of individual or group projects. In Advanced Hydrology, for example, group project reports and oral presentations have traditionally been a highlight of the course. However, with last years class size of 78 students, 4 lectures would have been required for students to present 8 minute oral presentations in groups of about 4. Unfortunately, allocating 4 lecture hours to oral presentations was unfeasible because it impacts on limited lecture and lab time necessary for covering other critical technical material. Unless other alternatives were sought to provide students with opportunities to practice oral presentations, engineering student oral communication skills would suffer.

The lack of previous experience in giving oral presentations can readily be seen when final year students are given an opportunity to present their capstone final year project, and do a poor job of it. In other engineering disciplines, where final year projects are not a requirement, students can go through their academic career without having the opportunity to practice or give an oral presentation. The challenge for engineering educators is thus clear - how best to provide students with oral presentation skills in engineering classes without impacting or diluting technical engineering material. In this article, a way to incorporate oral presentation practice in any course is presented, with minimal impacts on class time and with the added benefit of being able to cover additional technical material that can't be covered in normal lecture, tutorial, or lab time.

Development of the Virtual-i Presenter (ViP) program

A software program called *Virtual-i Presenter* (ViP) was developed to help students improve presentation skills. ViP allows users to create, review and evaluate oral presentations using a webcam and a PowerPoint presentation. The program is simple to use and allows students to practice and improve their oral presentation skills outside of classroom and still receive peer and academic feedback. ViP can be used to prepare students for oral presentations earlier in their academic careers and allow them to do a better job when given an opportunity to present live. Although commercial software exist to create digital videos using webcams and PowerPoint

(Camtasia Studio, and others), ViP was specifically designed for creating, practicing, and evaluating presentations with the following features:

- a) A simple and user friendly interface for the exclusive purpose of creating and viewing oral presentations in real time (w/ PowerPoint and a webcam).
- b) No video or audio editing capabilities. Most commercial video software enables the user to edit video, including clipping, joining, and formatting video and audio. Editing video/audio is contrary to the premise of helping the user improve oral presentation skills. Without editing capabilities, the presentation becomes closer to how live presentations are given.
- c) A system to evaluate presentations, enabling the presenter to receive both technical and presentation skills feedback.
- d) The ability to quickly create a mobile device video of the presentation for wider dissemination.

No commercially available software was found that met all the above requirements and thus ViP was created. ViP is now available at the following site: <http://www.virtual-i-presenter.info>

Creating, viewing, and evaluating presentations with ViP

The ViP program integrates a PowerPoint presentation with a digital video recording of the presenter (captured by a webcam) and recreates how a student would deliver an oral presentation in class. The ViP does not allow editing of the video or PowerPoint, but does allow the student to practice the presentation over and over until they are content with it. The final version of the presentation is submitted and can then be viewed and evaluated by other class members and the lecturer. The evaluation allows the presenter (student) to obtain feedback on their oral presentation skills and on the technical merits of the material presented.

ViP was programmed in object oriented MS Visual Basic 2005 dotNET. It requires a PC with PowerPoint installed, a webcam (built-in the computer or external), and microphones/speakers. Video feed from the webcam is automatically detected by the software. A simple and user friendly graphical user interface minimizes the software learning curve; effectively allowing new users to immediately start creating presentations.

Creating a ViP presentation:

A new ViP presentation is created by starting the ViP program and clicking on the program's create tab (Figure 1). The user can then press the button to preview the video feed from the webcam and choose the audio recording microphone. The user then places the webcam to satisfy an adequate coverage of the presenter. A title and Id number for the presentation can also be entered. Three buttons at the bottom right of the screen are used to create the ViP:

1. Open PPT: This button is used to open the desired PowerPoint presentation from any folder within the user's computer. The PowerPoint presentation is shown in the screen to the left (Figure 1 shows a presentation on "Enhancing Oral Presentation Skills...".)
2. Record Presentation: This button is pressed when the user is ready to start the oral presentation. The program prompts the user for a file name to store the ViP presentation.

- The video and sound are recorded together with the currently displayed PowerPoint slide. The user clicks the “Next Slide” button to move to the next PowerPoint slide.
3. Stop and Save ViP presentation: This button is pressed to stop and save the ViP presentation when the presenter has finished.

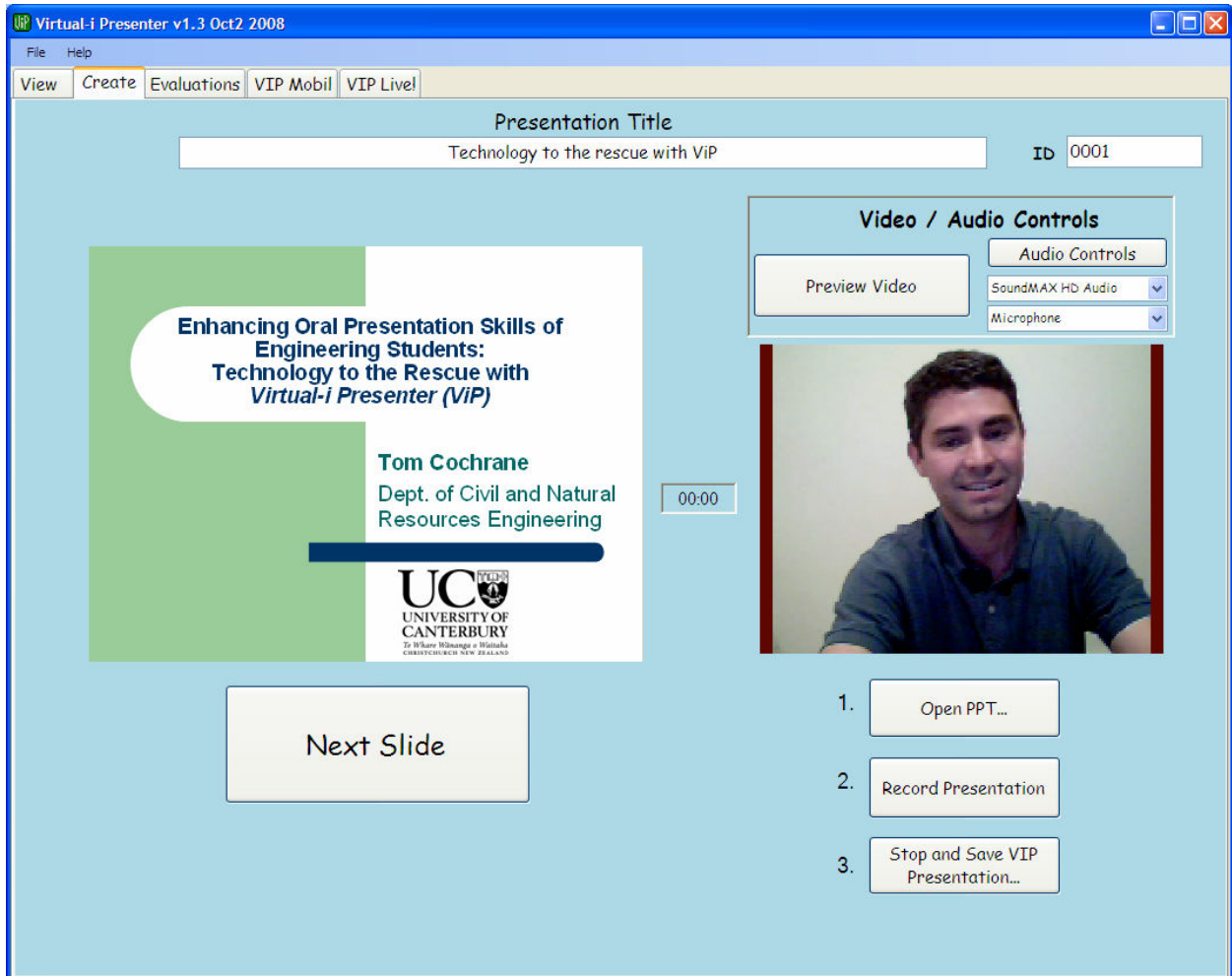


Figure 1: Creating a presentation with ViP featuring a PowerPoint slide presentation and streaming video from a webcam.

Viewing and evaluating a ViP presentation:

A previously created ViP presentation can be viewed by clicking the program’s view tab (Figure 2) and presses the “Open ViP presentation” button. The user is prompted for the ViP file name. The presentation title, Id, PowerPoint, and video are then displayed. The video and the PowerPoint slides are synchronized and the viewer has the ability to Pause, Stop, Play, and change the volume and balance of the presentation. At the bottom of the view screen, the viewer can evaluate the presentation and save the evaluation to a file, which can later be sent to the course lecturer or to the actual presenter. The example evaluation form shown in Figure 2 consists of assigning a mark from 0 to 5 for technical content, presentation clarity, misc. marks, and the ability to write specific comments in the comment box.

The evaluation form that the viewer sees is selected by the creator of the ViP presentation. Several evaluation options are available to choose from under the Evaluation tab. Evaluations can also be customized according to what the ViP presenter wants feedback on. This is done after creating the ViP presentation, before making the presentation available to others. If the presenter does not select a specific evaluation form, a standard form is displayed. Results from the evaluations are either saved to a file that can be sent back to the presenter (or lecturer) or the evaluation can be sent directly to a web based database via the internet.

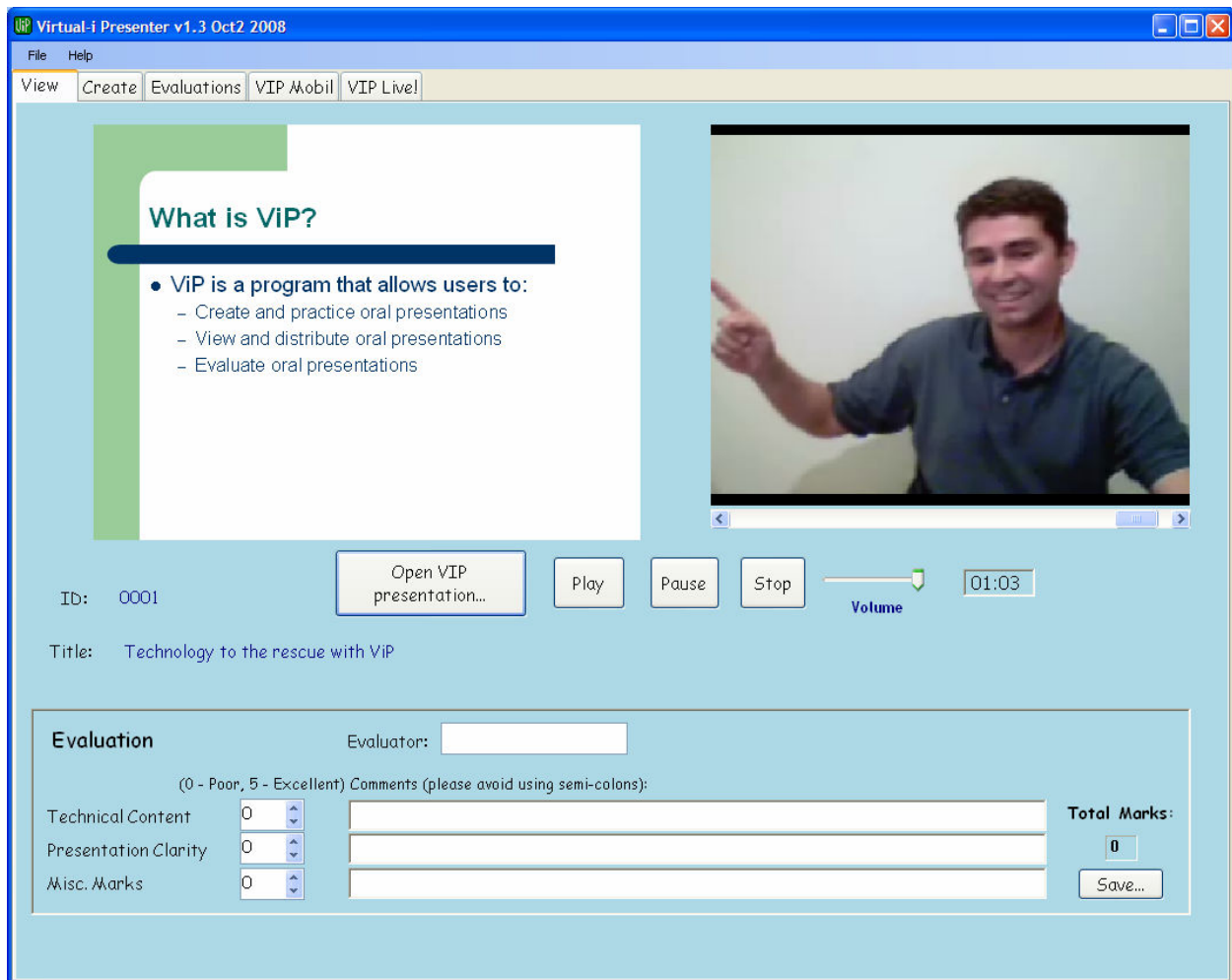


Figure 2: Screen for viewing and evaluating a previously created ViP presentation.

Creating a ViP mobile device video:

Recently, a new feature was added to the ViP program which allows users to convert their ViP presentations to a mobile video format (Ipod, wmv, etc.). This feature is found under the ViP Mobile tab as shown in Figure 3. The user opens a ViP presentation and chooses to display either the PowerPoint or the video in the mobile video screen. Regardless of whether the PowerPoint or video is recorded in the mobile screen, the audio is always from the video. The final product is a single screen video that can be disseminated via mobile devices or the internet

(YouTube or otherwise). This feature is available in the current version, but has not been tested in class.

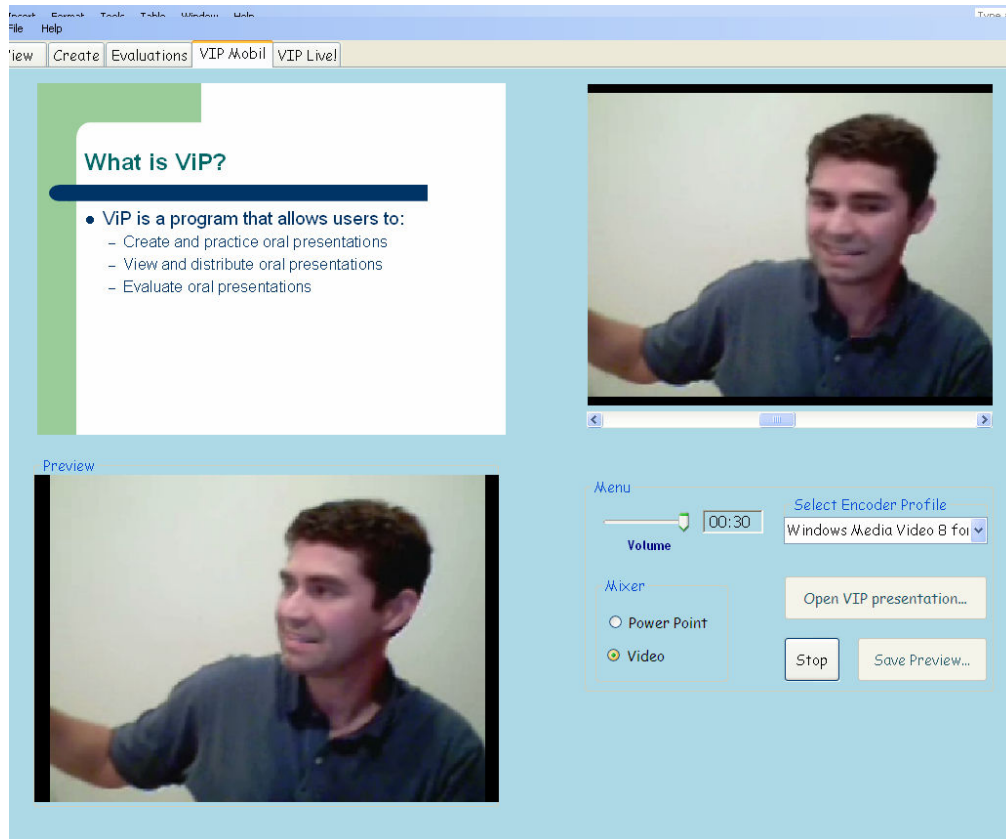


Figure 3. Creating a mobile device video from a ViP presentation.

Case studies using Virtual-i Presenter in small and large engineering classes

ViP with a small class of junior level students:

ViP was initially tested on a group of 19 natural resources engineering students in their third year of studies (junior year). The students were divided into 10 groups (9 groups of 2 students and one individual) and were required to choose an Environmental Impact Assessment report from a list of large national project reports. They were then asked to write a critical review and create a 6 minute oral presentation using ViP which included i) project identification and purpose, ii) status of the project now, and when the report was prepared, iii) main environmental impacts foreseen, iv) whether the assessment conformed to the 4th Schedule of the New Zealand Resource Management Act requirements, and v) their own views of the project and its environmental impact. The assignment was worth 10% of their grade with 5 for the written review and 5 for the oral presentation. The oral presentation was evaluated by both peers and the lecturer. Evaluations for all presentations are collected digitally by the lecturer using the ViP evaluation system and a summarized feedback report was given to each presenter. At the end of the class students were given a survey to provide written individual feedback on the use of ViP.

Students were given a brief 10 minute tutorial on using ViP in class. They were provided with the ViP program for installation on their laptops, webcams and microphones were available for loan, and a small computer room was set up with webcams, microphones/speakers, and the ViP software installed on desktops. Seven out of 10 groups create their ViP presentations in the designated computer room and 3 groups created ViP presentations on their laptops. All groups were able to create and submit their presentations on time.

There was a wide range in the quality of oral presentations. However, the general format adopted by students who did their presentations in the computer room was to present while sitting down and showing both group members on screen. For some of the weaker presentations, students resorted to reading text and avoiding eye contact with the camera. The most successful presentations as evaluated by the lecturer and students were the ones in which presenters stood up, were individually focused in the video, didn't read, had good eye contact, smiled, and used appropriate humour. The quality of the oral presentation also seemed to be linked to the clarity of the PowerPoint slides. Good oral presentations usually had clear and simple slides and made appropriate use of graphics or photos. The more ingenious presentations were done on laptops with outdoor backgrounds.

Excerpts from selected presentations were projected on a large screen during class time for discussion. A productive learning atmosphere was created in class, feedback was positive, and students enjoy watching and discussing parts of each others presentations. The ability for the lecturer to guide the discussion on selected portions of ViP presentations was something unique that wasn't possible in pervious years with live presentations.

ViP with a large class of senior level students:

Following the success of using Vip in a small class, ViP was trialled in a large civil engineering hydrology class of 78 students in 2008. In previous years, the course had an average enrolment of 35 students, and one of the key features was a group project worth 25% of the final grade on a hydrological theme not covered in class. The topic was chosen by the students and presented to the whole class via a report and a short oral presentation. Last year, the enrolment jumped to 78 students and doing the group presentations in class was no longer deemed feasible as it would take over 4 lectures to do this. ViP was a viable alternative to do without taking up limited class time. Students were therefore asked to do a 6 minute ViP presentation of their chosen topic (worth 7% of grade) and all students were asked to evaluate each others presentations. The students were divided into 18 groups. Laptops with ViP and webcams were made available to the student as well as lab computers and the software. A short 10 minute tutorial was given the student on how to use ViP and short clips of previous presentations were shown to the class as examples.

All groups were able to finish their presentations in time and all students evaluated each others presentations. In general, evaluations by students matched those given by the lecturers. Students clearly identified the good presentations, but seem to have been swayed more with presentation style than content. Uniqueness in presenting resulted in higher scores even though technical content of these presentations were sometimes weak. The ViP evaluation forms and the survey on ViP usage given to the large class were the same as that given previously to the small class.

Survey results of ViP usage from both the small and large class:

Students in both classes were asked to answer a survey questionnaire regarding the use of ViP. A summary of the main survey quantitative questions and results is presented in Table 1. Students were not required to complete the survey; however 79% of students in the small class and 71% of the large class provided responses. Thirty five percent of students in the large class (seniors) reported having limited video resource experience compared to 7% (1 junior student) in the small class and the rest reported having no experience.

Of significant importance was that students repeated (practiced) their presentations an average 4.33 times (small class) and 6.1 times (large class) before submitting their final one. This is a significant number, because most of our Civil students will do less than 3 oral presentations during their academic career. The survey also shows that a slightly longer time was spent making PowerPoint slides than recording the presentation and that the large class (senior) students spend approximately 1/3 longer on the PowerPoint slides and ViP recoding. Informal feedback from students suggests that many groups improved their PowerPoint presentations as a result of observing their first couple practice oral presentations.

It is believed that the larger amount of time spend by the large class doing presentations with ViP is related to the greater weight placed on their assignment grade as compared to the small class. It is also speculated that the senior students, being a bit more mature, were more meticulous in creating their presentation. From a qualitative judgment (and a quantitative grade), the overall quality of the large class (senior student) presentations were better.

Students reported that they preferred doing ViP presentations (60%) than live ones (40%). It is speculated that live presentations are feared more by students because of the live audience factor and that using ViP is more desirable because it allows students to redo presentations until they are happy with the final product.

Table 1: Selected survey questions and results from a small and large class.

Survey items/questions	Small Class	Large Class
Degree and level of students in class	Natural Resources Engineering (Junior year)	Civil Engineering (Senior year)
Number of students in class	19	78
Number of responses	15 (79%)	55 (71%)
Experience with video resources:		
None:	14 (93%)	36 (65%)
Limited:	1 (7%)	19 (35%)
Experienced:	0	0
<u>ViP usage</u>		
# of times presentation was recorded before submitting final ViP	4.33 (2.35)	6.1 (6.5)
time preparing powerpoint slides (hours)	2.03 (0.88)	3.2 (2.3)
time recording presentations with ViP (hours)	1.73 (0.86)	2.5 (1.8)

<u>Presentation preference</u>		
Short ViP (5 minutes)	8 (53%)	31 (56%)
Long ViP (10 minutes)	1 (7%)	3 (5%)
Live in-class presentations	6 (40%)	19 (35%)
Blank answer		1 (2%)
No preference		1 (2%)

The students were also directly asked if they believed that ViP helped them improve their presentation skills. Sixty percent answered positively and attributing this to the ability to view themselves present and improve through practice. Twenty five percent answered it didn't help them either because 1) they didn't get to present (this was the case for only a few students) or 2) they felt that the lack of a live audience was not conducive of them improving their skills. Fifteen percent did not comment.

The main technical difficulties reported were on enabling the microphone and setting up the program on laptops. There was a strong correlation between the groups of students that preferred live presentations and those reporting the greatest trouble with technical issues (microphone or laptop setup).

When asked if they would like to have lectures using ViP, most students reported that they would prefer live lectures, but that tutorials or other material in ViP would be welcome. Students reported that the best part of using ViP was the interaction between students while creating ViP's, being fun and amusing to use, practicing, and not doing it live. The worst part of working with ViP was reported as redoing the video when they made errors, not being able to edit or pause the presentations with ViP, and technical issues (microphone malfunction, installation).

By involving students in the task of assessment we can achieve two goals: a) foster skills of professional judgment, and b) improving reliabilities in assessing presentation scores³. The evaluation process using ViP seemed to achieve both of these. Students were required to evaluate their peer oral presentations as we would normally do in live class presentations; however, with ViP they did this during their own time and thus we obtained a 100% turnout on evaluations and scores were close to ones given by the lecturer. Peer evaluation scores were averaged with the lecturer score. Most students in the large class reported that they enjoyed viewing and evaluating their peer presentations; however some students complained that reviewing 18 presentations (6 minutes each) was too much and that some presentations were just too boring. Based on this feedback, a new system will be implemented in future years where each person is required to review a maximum of 10 other presentations (at random) ensuring all presentation are review by at least 10 peers in the class of 80 students. No complaints were received from the smaller class that reviewed 10 presentations, and thus reviewing 10 presentations seems to be an adequate number. In addition to the formal evaluation, students will be asked to rate presentations they review (for example, a system of 1 to 4 stars). Students can then voluntarily review other presentations if they wish. It is expected that that top rated presentations will be reviewed more often. Selected presentations will be discussed in class.

Additional uses of ViP

A few engineering programs around the world have incorporated specialist courses in their curriculum to enhance students' ability to communicate effectively⁴. Within these there are a wide range of traditional approaches to teaching communication skills, including following basic principles of the Quintilian Institutes of Oratory⁵; all requiring students to practice oral presentation skills in front of an audience. Some alternative approaches to teaching oral communication skills argue that communicating is more an attitude than a highly specific skill to be learned and thus teaching should be approached by using visual rhetoric⁴. Visual rhetoric, using tool such as PowerPoint, is believe to enhance students' ability to communicate effectively beyond traditional means⁴. In either case, it is believed that the ViP program could help students improve their skills by allowing them to practice and see themselves perform. Furthermore, by allowing the presenter to be part of the audience, the presenter will have a self realization of how effective the presentation was, and thus seek to improve both the visual PowerPoint and the oral presentation.

The One-Minute Engineer method⁶ is a novel approach to help students learn about the engineering discipline, and it also gives students the opportunity to practice presentation skills in class. ViP could be used to complement and extend the One-Minute Engineer approach⁶ by allowing students to create longer and more detailed presentations about their engineering topic which students could view in their own time. It would also provide a way for students to practice beforehand, and therefore perform better, when presenting their one minute presentation to their class.

ViP also bridges the gap between oral presentations and advanced webcam based communication technology. The use of communications and instructional technology is one of the major trends that affect the practice of engineering and necessitate the acquisition of skills beyond technical skills⁷.

Finally, ViP applications are not restricted to undergraduate students. ViP can be used by postgraduate students to enhance oral presentation skills for defending a thesis or presenting a paper at a conference. Lecturers can use it to enhance presentation skills or to provide students with special tutorials outside of class time. ViP applications are also envisioned in industry and research.

Conclusions

In large engineering classes, assigning lecture time for oral presentation becomes unfeasible, and thus the use of ViP is a way to allow students to improve presentation skills where otherwise they couldn't. In small classes, ViP provides a means for students to practice and perfect their presentations, obtain feedback, and to keep them for future use. Apart from minor technical difficulties involving audio and installation (which are being resolved), the student's experience with ViP was positive as reported by the surveys and seen by the actual presentations created. The program allowed students to practice and review presentations as well as obtain feedback from peers and academics through the evaluation process. Furthermore, by students being able to "see and hear" themselves present, it made them aware of their oral skills or fallacies and

motivated them to enhance presentation skills by practicing more. Live presentations can not and should not be substituted fully; however, ViP enables students to become better prepared for when they have a chance to give a live presentation. A range of other applications of ViP are envisioned to help students, lecturers, and others improve oral presentation skills including the use of mobile video. Although the ViP feature to save presentations for viewing in mobile devices was not tested in class yet, teaching and learning applications with it will be explored in the future.

Bibliography

1. ABET, Criteria for Accrediting Engineering Programs, Baltimore, Md.: Engineering Accreditation Commission, Nov. 11, 2003. See http://www.abet.org/criteria_eac.html.
2. Felder, R.M. & Brent, R. (2003). Designing and Teaching Courses to Satisfy the ABET Engineering Criteria. *Journal of Engineering Education*, 92 (1), 7-25. The bibliography must begin four spaces below the body of the paper.
3. Magin, D., & Helmore, P. (2001). Peer and Teacher Assessments of Oral Presentation Skills: how reliable are they? *Studies in Higher Education*, 26(3), 287-298.
4. Mottart, A. and Casteleyn, J. (2008). Visual Rhetoric Enhancing Students' Ability to Communicate Effectively. *Int. J. Engng. Ed.*, 24(6):1130-1138.
5. Quintilian, Institutes of Oratory. Retrieved from <http://honeyl.public.iastate.edu/quintilian/index.html> (Feb. 1, 2009)
6. Jaeger, B. and Bilen, S. (2006). The One-Minute Engineer: Getting Design Class Out of the Starting Blocks. *Proceedings of the ASEE National Conference*, Chicago, IL, June, 2006.
7. Oberst, B.S., & Jones, R.C. (2004). Canaries in the Mineshaft: Engineers in the Global Workplace, (CD) *Proceedings, 2004 American Society for Engineering Education Conference*.

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