

PowerPoint Presentations: Do They Really Work?

Richard O. Mines, Jr.¹

Abstract

This paper focuses on the use of PowerPoint presentations to improve learning in a required undergraduate course in Environmental Engineering at Mercer University. PowerPoint presentations were used throughout the semester to enhance student interest and hopefully improve student performance. Handouts of the PowerPoint slides were given to each student at the beginning of each class.

Introduction

In recent years, the public, industry, and legislatures have increasingly scrutinized the university educational systems. The United States Accreditation Board has established engineering Criteria 2000 for Engineering and Technology (ABET) to make engineering schools accountable for improving communication skills, teaming skills, lifelong learning skills, and awareness of global and societal issues. In addition to those skills, engineering graduates must have a firm knowledge of math, science, and engineering fundamentals. The primary impetus for this change was to improve the overall quality of engineering education. Felder and Brent (1998) discuss this reform movement in higher education. They suggest that it will take more than faculty development to have a lasting reform and administrators must modify the faculty incentive and reward system by making educational scholarship and disciplinary scholarship comparable in the promotion and tenure process.

The use of multimedia presentations and the Internet has been heralded as one method to enhance learning. Christensen and Barrett (1997) described how the Internet was used to distribute a full range of course materials to enhance off-campus education at the University of South Florida. The use of computers and commercially available software was discussed by Ferguson (1997) to increase understanding and supplement lectures. Juriasingani et al (2000) reported on the use of CD-ROM PowerPoint based presentation to illustrate the installation of sewers and water mains. The authors report that the students enjoyed the computer based visual learning but offered no formal assessment of the presentation. The use of PowerPoint presentations to teach Circuits I at the University of Missouri-Columbia was presented by Slivinsky (2000). An example questionnaire to assess the course was provided in the paper, unfortunately, a thorough assessment of the value of the techniques used had not been undertaken. Buchanan and Coowar (1995) promote the use of PowerPoint software to enhance lectures. They primarily discuss the mechanics of preparing PowerPoint slides and do not assess the use of the software. A workshop was presented by Jack (2000) which covered successful methods of using high tech systems for making classroom and conference presentations. Several techniques were suggested for a successful presentation along with a list of the top ten mistakes made by presenters.

¹ Associate Professor and Program Director of Environmental Engineering, Mercer University, 1400 Coleman Avenue, Macon, GA 31207.

Although multimedia and innovative teaching methods are being promoted to enhance learning, some proponents still favor the traditional lecture. Barger et al. (1996) review the characteristics of good information transfer procedure and show how the traditional lecture meets those requirements.

The state of Florida has instituted a Teaching Improvement Program (TIP) for all state universities for enhancing the quality of teaching, primarily at the undergraduate level. Recipients of this award receive an additional \$5,000 to their base salary as long as they remain employed in the State University System (Najafi, 1997). The author received such an award while at the University of South Florida. Throughout his teaching career, he has tried a variety of techniques to enhance and improve learning in engineering education. This paper discusses the author's latest attempt to improve student learning by using PowerPoint presentations in a required undergraduate environmental engineering course at Mercer University in Macon, Georgia. An analysis of variance was performed on student's final grades when the course was taught in a traditional lecture format versus using the PowerPoint presentations for comparison.

Methodology

Statistical analyses employing the analysis of variance (ANOVA) test at the 95% confidence level were performed on student's grades on projects, final exams, and final grades to assess if the PowerPoint presentations enhanced student performance. ANOVAs were performed comparing the performance of students in the three areas above for three course offerings of EVE 405 Water and Wastewater Treatment. EVE 405 is a junior/senior level undergraduate course required of all environmental engineering majors that provides in-depth instruction on the application of water quality data to the selection and design of potable water treatment facilities and municipal wastewater treatment facilities. During the fall semester 1998, the course was first offered and was taught in the traditional lecture format using the chalkboard. Eleven students were enrolled in the course during the 1998 fall semester. During the 1999 fall semester and 2000-spring semester, PowerPoint presentations were used rather than the traditional classroom lecture using the chalkboard. For the 1999 fall semester, six students were enrolled in the class, whereas, ten students were enrolled in the 2000 spring semester.

Subjective experiences of the students were also compiled from teacher evaluations and are presented below.

Results and Discussion

Results of the ANOVA statistical analyses are presented in Tables 1, 2, and 3. Table 1 shows the results of the analysis of variance performed on the final exam grades. There was no significant difference between the final exam grades since the Fisher value of 2.59 was less than the critical Fisher value of 3.40 for two degrees of freedom in the numerator and twenty-four degrees of freedom in the denominator. It appears that the PowerPoint presentations did not affect the final exam grades.

Table 1. Analysis of Variance of Final Exams

F	F_{critical}	df	a
2.59	3.40	2, 24	0.05

Table 2 presents the results of the analysis of variance performed on the design project grades. There was a significant difference between the design project grades since the Fisher value of 6.60 was greater than the critical Fisher value of 3.40 for two degrees of freedom in the numerator and twenty-four degrees of freedom in the denominator. It appears that the PowerPoint presentations may have had a positive effect on the design project grades. The average student grade on the design project was 2.45, 2.83, and 3.70, respectively, for the 98, 99, and 00 offerings of EVE 405.

Table 2. Analysis of Variance of Design Projects

F	F_{critical}	df	a
6.60	3.40	2, 24	0.05

Table 3 presents the results of the analysis of variance performed on the overall student grades. There was no significant difference between the overall student grades since the Fisher value of 2.72 was less than the critical Fisher value of 3.40 for two degrees of freedom in the numerator and twenty-four degrees of freedom in the denominator. It appears that the PowerPoint presentations had no effect on students' final grades. The average final grade was 2.64, 2.00, and 3.05, respectively, for the 98, 99, and 00 offerings of EVE 405.

Table 3. Analysis of Variance of Final Grades

F	F_{critical}	df	a
2.72	3.40	2, 24	0.05

Subjective Results

Presented in this section are the positive (Table 4) and negative (Table 5) comments from the students enrolled in EVE 405 during the 1999 fall semester and 2000-spring semester regarding the PowerPoint presentations.

Table 4. Positive Comments About PowerPoint Presentations.

1. Good for general information, especially when information is limited and recollection is not required.
2. I am able to follow along easier and comprehend with PowerPoint.
3. They are a great help in learning since we don't have to worry about writing all the notes down.
4. Dynamic presentations with sound and animation keep student's interests.
5. Easy for the presenter to use and cover a lot of material in a short time.
6. Lectures clearly outlined and readable.
7. Professor can print out handouts for the students to follow.

Table 5. Negative Comments About PowerPoint Presentations.

1. Not good for detailed information that must be learned and understood.
2. I spend most of the time trying to get all the notes when they are written on the board and do not always comprehend.
3. Harder to understand when the teacher is explaining a long derivation on many slides.
4. Teacher does a better job of explaining the material when writing on the board.
5. Not as easy to emphasize the most important points and understand when reviewing.
6. Students pay less attention during the lectures since they have handouts to rely on
7. When lights are dim during the presentations, students tend to get sleepy.
8. There is not as much interaction between professor and students.

Summary and Conclusions

A statistical and subjective assessment of the use of PowerPoint presentations in an undergraduate environmental engineering course was undertaken. Student grades on final exams, design project, and overall final grades were compared to student grades when the course was taught in the traditional lecture type format. Based on the analysis of variance at the 95% confidence level, there was no significant difference in student grades on final exams and overall final grades. However, student performance on the design project appeared to be enhanced through the use of the PowerPoint presentation.

The general consensus of students taking the course was that PowerPoint presentations were good for discussing general information and not good for presenting detail engineering equations and derivations. Most students commented that they learned better from the traditional lecture format rather than from the PowerPoint presentations. Students stated they learned and retained the material as they copied the information from the board.

Major conclusions from this study:

- PowerPoint presentations did not result in overall higher final examination grades or course grades.
- PowerPoint presentations did appear to improve student grades on the design project.
- Students liked the PowerPoint presentations, however, they stated they learned more and understood complex material better when using the traditional lecture format because they learned and retained the material better as they copied the information from the board.

References

- Marilyn Barger, Renata Engel, and Richard Gilbert (1996) "How About A Good Lecture?" *Proceedings of the 1996 ASEE Annual Conference*, Milwaukee, WI.
- Walter W. Buchanan and Rosida Coowar (1995) "Using PowerPoint Software to Enhance Your Engineering or Engineering Technology Lectures," *Proceedings of the 1995 ASEE Annual Conference*, Anaheim, CA.
- Kenneth Christensen and Andrew Barrett (1997) "Using the Internet to Enhance Off-Campus Engineering Education," *Proceedings of the 1997 ASEE Southeastern Section Conference*, Marietta, GA.
- Gregory Ferguson (1997) "Using Multi-media Resources for Demonstrating Engineering Science Concepts," *Proceedings of the 1997 ASEE Southeastern Section Conference*, Marietta, GA.
- Richard M. Felder and Rebecca Brent (1998) "Faculty Development: Getting the Sermon Beyond the Chori," *Proceedings of the 1998 ASEE Annual Conference*, Seattle, WA.
- Hugh Jack (2000) "High Tech Presentations the Easy Way," *Proceedings of the 2000 ASEE Annual Conference*, St. Louis, MO.
- Purshotam Juriasingani, R. Bruce Robinson, and Chris D. Fox (2000) "Installing Sewers and Water Mains: An Educational CD-ROM," *Proceedings of the 2000 ASEE Annual Conference*, St. Louis, MO.
- Fazil Najafi (1997) "An Analysis of the Teaching Improvement Program at the University of Florida," *Proceedings of the 1997 ASEE Southeastern Section Conference*, Marietta, GA.
- Charles Slivinsky (2000) "Multimedia and Web Techniques for Teaching Circuits I," *Proceedings of the 2000 ASEE Annual Conference*, St. Louis, MO.

Richard O. Mines, Jr.

Dr. Richard Mines is an Associate Professor and Program Director of Environmental Engineering at Mercer University in Macon, Georgia. Dr. Mines graduated from the Virginia Military Institute with a Bachelor of Science degree in Civil Engineering in 1975. He received a Master of Engineering degree in Civil Engineering from the University of Virginia in 1977 and a Doctor of Philosophy degree in Civil Engineering from Virginia Tech in 1983. Dr. Mines has over six years of consulting experience with CH²M Hill and BLACK & VEATCH consulting engineers. He has over twelve years of teaching experience at the undergraduate and graduate level. Dr. Mines taught at the Virginia Military Institute and the University of South Florida prior to his coming to Mercer University. He is a registered Professional Engineer in Florida, New Mexico, and Virginia. Dr. Mines has authored or co-authored over 60 technical and educational papers on civil and environmental engineering. His research interests lie in water and wastewater treatment, modeling of bionutrient removal systems, and enhancing teaching in the classroom. Dr. Mines is an active member of ASEE, ASCE, and WEF.