

THE EFFECT OF POWERPOINT PRESENTATIONS ON ACADEMIC ACHIEVEMENT OF B.Ed. TEACHER TRAINEES

(Pratibha Sagar and N.N. Pandey, Assistant Professor and Professor, Department of Education, MJP Rohilkhand University, Bareilly. Pratibha_ru@yahoo.com and nnpandey57@yahoo.com)

Abstract

In the present study the effect of PowerPoint presentations on academic achievement of B.Ed. teacher trainees has been examined. The study used two intact classes (62 students in each) of B.Ed. Specialization students. An achievement test developed and standardized by researcher was administered on both classes to obtain pre-test scores. Both classes were taught the same content for 34 instructional days (40 minutes per day). Experimental group was taught by lecture supported by PowerPoint presentations to learn the content while control group was taught by traditional lecture. After experimentation post-test scores on achievement test were obtained. Data analyzed through analysis of covariance revealed that there is significant difference among the two teaching methods with regard to achievement of the teacher trainees and achievement of girls is better than boys using PowerPoint.

Keywords: *PowerPoint presentations, Academic Achievement.*

Introduction

With the advancement in information and communication technology, PowerPoint presentations have been extensively used in higher education because of ease of use, user friendliness, structured presentation and multimedia approach. Lectures have been the most common form of teaching and learning in higher education institutions as its format is simple and straightforward (Brown and Atkins, 1988; Estes et al., 2009). The teacher presents (and illustrates, demonstrates, etc.) large amounts of information to large audiences in limited time. It gives the teacher total control of content, pace, organization and direction. While lecturing has above advantages, it has been criticised for its lack of student engagement and inability to stimulate higher-order thinking. Student learning occurs through active engagement with the subject matter and therefore, lectures are ineffective for such engagement (Ramsden, 2003; Billings and Halstead 1998). Furthermore, transmission of information and its transformation into knowledge are not the same (Race, 2007). For this transformation to occur, students need an opportunity to engage in deep processing of the subject matter. It is clear that the simple transmission of information through a lecture is not an effective approach for meeting the goals of helping students become independent, critical problem solvers, able to interact with their peers in social and employment situations. Besides these threats of obsolescence, pedagogically lecturing is a flawed approach to teaching and should be replaced by more effective teaching paradigms. This has created the rationale for replacing lectures with information delivered by computers in form of PowerPoint presentations.

PowerPoint has the potential to help students research, organise and present information to their peers with professional looking graphics and concise information while engaging in active learning. One of the PowerPoint's main features is that it provides structure to presentations. This enhances lecturers' ability to order and pace lectures (Mason & Hlynka, 1998) and to present clear summaries (Lowry, 1999). The structure and organization inherent in PowerPoint presentations may positively influence students' learning. Freedman (1989) found in a meta-analysis of studies concerning students' teacher evaluations that student achievement was most highly correlated with ratings of lecture organization and structure.

The researches regarding the impact of lecturing with PowerPoint on academic performances have mixed results. Some researchers have found that it enhances students' academic performance (Ahmed, 1998; Kask, 2000 on female students; Lowry, 1999; Mantei, 2000; Szabo and Hastings, 2000, Exp. 2, Smith and Woody, 2000). Mantei (2000) compared students who were taught with PowerPoint presentations and had access to lecture notes in advance to students who were taught in traditional format and lacked access to lecture notes. Thus, the effect on academic performance could have been due to PowerPoint, the notes, or the combination of the two. Although it was not discussed whether students who received PowerPoint lectures were provided with lecture notes, but it was claimed this was a beneficial aspect of computer-aided presentations. Whereas other studies found that there was no effect of PowerPoint presentations on students' performance (Daniels, 1999; Kask 2000 on male students; Rankin and Hoaas, 2001; Szabo and Hastings, 2000, Exps. 1 and 3). The differing patterns of findings may be due to the methodologies employed. The research indicates that students prefer PowerPoint type presentations to presentations from transparencies (Cassady, 1998; Perry & Perry, 1998; Susskind & Gurien, 1999; West, 1997). Unfortunately, information on whether computer presentations improve student performance is much less clear. One study demonstrated a decrease in student performance when the instructor switched from transparencies to PowerPoint (Bartlett *et al.*, 2000). No significant effect of the method of instruction on students' performance was found in a study by Rankin and Hoaas (2001). Many courses that adopted multimedia presentations have not shown a corresponding increase in student performance (Stoloff, 1995; Susskind and Gurien, 1999; Szabo and Hastings, 2000, Exp. 1 and 3; West, 1997).

Therefore, understanding the use of *PowerPoint* and identifying practices that are effective and meaningful can guide teacher educators in the design and development of *PowerPoint* presentations that support student learning in terms of academic achievement. The survey of literature shows that there is no consistency in findings regarding effect of lecture accompanied by PowerPoint presentations on achievement. Differences in the findings as well as dearth of studies in Indian conditions created the background for present investigation. Hence, a need was felt to study the effect of PowerPoint Presentations on achievement of B.Ed. teacher-trainees.

Objective of the Study

The objectives of the present study are:

1. To study the effect of PowerPoint presentation on achievement of B.Ed. teacher trainees.
2. To find out gender differences in academic achievement of B.Ed. teacher trainees.

3. To find out the effect of interaction between gender and teaching method on academic achievement of B.Ed. teacher trainees.

Hypotheses

Keeping in view the second and third objectives of the study the following hypotheses were formulated in null form:

- H_{01} : There is no significance difference in the mean achievement of B.Ed. teacher trainees taught by lecture method and lecture accompanied by PowerPoint presentation.
- H_{02} : Boys and girls do not differ significantly in relation to their academic achievement.
- H_{03} : Teaching method by gender of B.Ed. teacher trainees will not significantly affect academic achievement.

Methodology

This research was experimental in nature where pre-test –post-test, non equivalent control group design was used. Three B.Ed. specialization courses run in MJP Rohilkhand University, Bareilly campus, out of which teacher trainees of B.Ed. (Specialization in Vocational Education) and B.Ed. (Specialization in Educational Computing) groups were chosen. Two groups B.Ed. (Educational Computing), the experimental group, taught through PowerPoint presentations and B.Ed. Vocational Education, the control group, taught through traditional lecture method, were selected for the study. One intact class served as the experimental group and the other as the control group. Treatments were assigned randomly.

Achievement Test – (AT), developed and validated by the researchers, was used for the investigation. Since the study aimed at finding out the relative effect of two different methods of teaching, the test was designed to assess the degree to which learners acquired the content taught to them. Two chapters from Educational Psychology, namely learning and learning theories were selected for teaching in the study and the achievement test was based on these two chapters.

Teacher competence was controlled as the researcher himself taught both the experimental and control groups. Length of instruction was also controlled as each teaching session in each group lasted for one period of 40 minutes. Teaching session was planned for morning and afternoon time for control group and experimental group respectively on one day and next day morning time was allotted to experimental group and afternoon time for control group. Analysis of covariance (ANCOVA) was used to analyse data where pre-test achievement scores was taken as covariate.

The total experimentation procedure was planned and organized in successive steps in order to facilitate proper collection of data. Firstly achievement test was administered for pre-test scores then both the groups were taught for 34 working days. After a gap of two days, achievement test was again administered for post-test scores.

Analysis and Discussion

2X2 analysis of covariance (ANCOVA) was carried out on the data yielded through achievement tests. Table 1.1 presents means and standard deviations for the various groups and the results of ANCOVA for academic achievement for AT-post have been shown in Table - 1.2.

Table 1.1 Mean and standard deviation for academic achievement

		N	Mean	Standard Deviation
AT Pre	Control Boys	49	35.35	10.60
	Control Girls	13	37.00	5.52
	Total	62	35.69	9.74
	Exp. Boys	40	33.35	7.18
	Exp. Girls	22	36.50	6.60
	Total	62	34.47	7.09
AT Post	Control Boys	49	50.37	11.83
	Control Girls	13	54.92	8.92
	Total	62	51.32	11.37
	Exp. Boys	40	54.90	10.86
	Exp. Girls	22	64.68	8.00
	Total	62	58.37	10.94

Table 1.2 Summary of ANCOVA for academic achievement

Source	Sum of Squares	Df	Mean Square	F
Group (Teaching method)	1661.666	1	1661.666	37.205**
Gender	545.306	1	545.306	12.210**
Teaching method * Gender	84.231	1	84.231	1.886
Error	5314.828	119	44.662	
Total	389743.00	124		

** - Significant at 0.01 level of significance

Looking at the F value in above table, it can be stated that the main effect for teaching method was found to be highly significant ($F=37.205$, $p<0.01$). The significant F – value shows that significant difference exists in academic achievement of students taught by the two methods. Thus the hypothesis (H_{01}) – there is no significance difference in the mean achievement of B.Ed. teacher trainees taught by lecture method and lecture accompanied by PowerPoint presentation – is rejected. It refers that teaching method affect the academic achievement significantly.

The main effect for gender was also found to be significant ($F = 12.210$, $p < 0.01$). The significant F – value means that boys and girls differ in their achievement. Hence the null-hypothesis (H_{02}) that gender of teacher trainees will not significantly affect academic achievement is also rejected.

In addition to this, the interaction effect of teaching method by gender is not observed affecting academic achievement of teacher trainees significantly, because F- value (1.19) for this is found to be non significant. Hence, null hypothesis (H_{03}) was retained. With a non significant interaction effect between teaching method and gender, it may be deduced that the main effect of gender i.e., the difference between the male and females, is independent of the effect of teaching method.

The adjusted means for different groups were obtained to clarify the nature of the difference. These means have been shown in Table – 1.3.

Table 1.3 Adjusted Means – Academic Achievement

	Control	Experimental	Total
Boys	50.107	56.592	53.350
Girls	53.046	63.294	58.170
Total	51.577	59.943	55.760

A look at the above table reveals that the mean of experimental group (59.94), taught through lecture with PowerPoint presentations is higher than that for control group. Thus the group taught through lecture with PowerPoint produced significantly greater achievement as compared to the group taught through lecture only. There may be various reasons for superiority of PowerPoint over traditional method. These include use of multisensory approach (text, graphics, audio and video) in presentations, proper integration of information, concepts and course material, well structured and organised lectures, presentation graphics are more attention capturing and interesting (Szabo and Hastings, 2000), preference for imagery representation on information by learner, proper management of class, ease in following and understanding of lecture and flow and clarity of information (Cassady, 1998, p. 185) and PowerPoint work as a stimulus for elaboration, explanation, and discussion in classrooms (Apperson et al., 2008, p. 153).

Although there are few studies which did not favour PowerPoint with respect to academic achievement Ahmed (1998), Daniels (1999), Moreno and Mayer (2000), Szabo and Hastings (2000, Exps. 1 and 3), Kask (2000) on male students, Beets and Lobingier (2001), Rankin and Hoaas (2001), Hilton and Christensen (2002), Bartsch and Cobern (2003), Grabe (2005), Koeber (2005), Lewis (2005), Susskind (2005), Debevec *et al.* (2006), Shallcross & Harrison (2006) and Daniels *et al.* (2007).

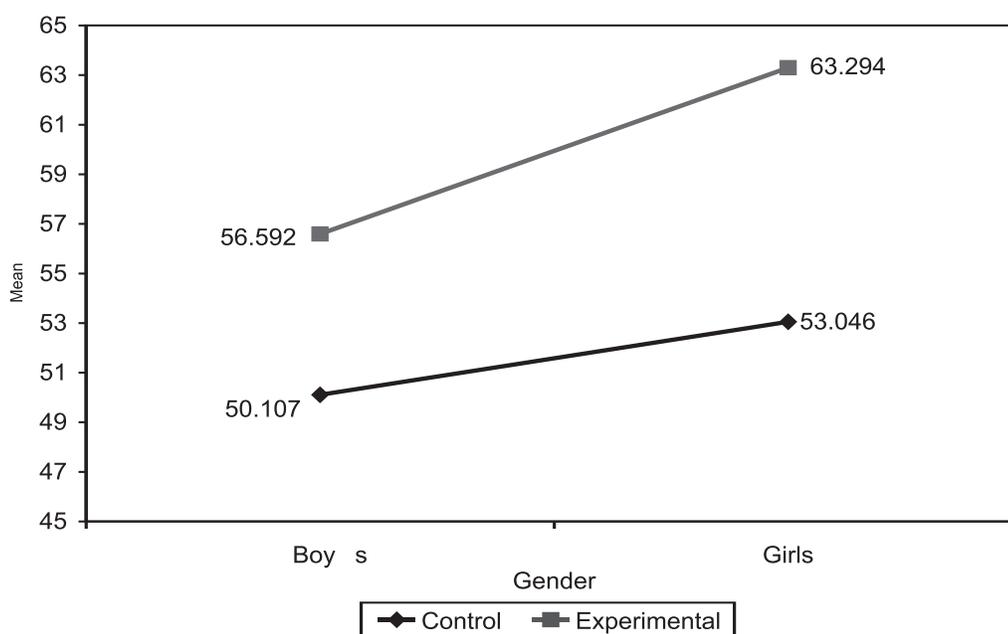
Superiority of PowerPoint presentations over traditional method of lecturing is generally supported by many researchers Jensen and Sandlin (1992), Harknett and Cobane (1997), Haugland (1997), Atkin-Sayre et al. (1998), Evans (1998), Weinraub (1998), Wilmoth and Wybraniec (1998), Lowry (1999), Kask (2000, on female students), Mantei (2000), Szabo and Hastings (2000 experiment 2), Cassady (1998), Perry and Perry (1998), Weatherly et al., (2002-2003), Grimstad and Grabe (2004), Blaclock and Montgomery (2005), Sugahara and Boland (2006), Craig and Amernic (2006), Fedisson & Braidic (2007), Fehn (2007), Lawler et al. (2007), Stephenson et al. (2008) and Jandaghi and Martin (2009). The results of the present research are in congruence with the previous research findings with regard to achievement. It may be concluded that PowerPoint presentations produces higher achievement for B.Ed. teacher trainees.

The adjusted means for AT post for different groups, shown in Table 1.3, reveal that girls (mean 58.17) achieved higher than boys (mean 53.35). The yielded difference between boys and

girls in their academic achievement is not peculiar in Indian setting. The factors responsible for this difference may be numerous. Traditional Indian thinking still favours sons over daughters. Most of the boys sent to school but the same is not true in case of girls. It is thought that son, after being educated, will support the family whereas girls are still supposed to be 'Paraya Dhan'. Sample boys came from different socio-economic background; many of them were first generation learners, whereas girls generally come from families higher in socio-economic status, having one or both educated parents. Moreover, girls are more focussed due to less exposure in outer world as compare to boys. Only one study, Kask (2000), was found to support this finding that female students perform better as compared to male students. However, it may be concluded on the basis of findings of this study that girls achieve higher than boys.

To further explain the effect of interaction, graphs were plotted between the adjusted means for AT-post means (Table - 1.3), and the same has been presented in figure 1 below.

Figure - 1 Adjusted Means – Academic Achievement



An analysis of adjusted means reveals that achievement gain in experimental group taught through PowerPoint presentation, is greater for girls (a change of 10.248 units, from 53.046 to 63.294) as compared to boys (a change of 6.485 units, from 50.107 to 56.592). It means that lecture assisted with PowerPoint is more beneficial to girls than boys but this difference is not as large to have any significant interaction effect.

Implications

With the National Curriculum Framework (NCF – 2005) having given way to judicious use of technology (Multimedia and ICT) to increase the possibilities of effective teaching and learning at varied pace, the subject matter of the present study becomes of much importance. It is of vital concern to teacher educators, policy makers and administrators in our educational setup. The traditional lecture has been criticised as encouraging surface rather than deep learning as it may not necessarily stimulate thinking, may promote a view of learning as remembering masses of isolated detail. The simple transmission of information through a lecture is not an effective approach for

meeting the goals of helping students become independent, critical problem solvers, able to interact with their peers in social and employment situations. Aside from threats of obsolescence, pedagogically lecturing is a flawed approach to teaching and must be replaced by more effective teaching paradigms. So the traditional lectures are replaced with information delivered by computers in the form of PowerPoint presentations as these presentations are more eye-catching and interesting, attention capturing which promotes higher order thinking for a student in the classroom setting.

All innovations require more time, money, energy, and patience in their implementation. Initially one may face certain challenges in using PowerPoint in classrooms but the gains promised are worth a trial. Use of computers in teaching learning environment in teacher education is viewed as one of the most challenging aspect in majority of Indian teacher education institutions. One of the contributing factors to this apprehension is the method our teachers use in classrooms. An urgent need is there to provide instructional strategies that can be used to integrate ICT in classrooms of prospective teachers. The present research shows that lecture supported with PowerPoint presentations can be one such strategy.

The study provides an excellent evidence of the effectiveness of PowerPoint presentations in enhanced performance of the students, if PowerPoint presentations are developed wisely. PowerPoint presentation breaks the routine monotony of lectures. It is suitable for teaching a large group which involves something more than mere information transfer. One of the key principles of effective teaching is that speech complimented by appropriate visual supporting aids is more likely to be remembered. Students will therefore follow a lecture more easily if they are using more than one of their senses. Visual cues can clarify a statement, eliminate ambiguity, add detail and are therefore powerful instructional aid. Visual aids like PowerPoint presentations improve communication in lectures because they procure attention, add variety, save time when explaining complicated points, introduce, summarise or integrate ideas, illustrate things which can only be explained graphically. By using such type of learning material, teachers can improve the understanding and knowledge of the students in any subjects. Even, in absence of teachers, it can engage students and prevent wastage of their time. Moreover, for effective learning, method of teaching and structure of content should be matched with intellectual development of learner. Keeping in view the above conclusion, it is suggested that in teacher training institutions, there should be modernization of lectures with proper integration of technology to improve classroom teaching.

References

- Ahmed C. (1998). PowerPoint versus traditional overheads. Which is more effective for learning?; **Paper presented at conference for the South Dakota Association for Health, Physical Education and Recreation.**
- Apperson, J. M., Laws, E. L., & Scepansky, J. A. (2006). The impact of presentation graphics on students' experience in the classroom. **Computers and Education**, 47, Pp. 116–126.
- Atkins-Sayre, W., Hopkins, S., Mohundro, S., & Sayre, W. (1998, November). Rewards and liabilities of presentation software as an ancillary tool: Prison or paradise? **Paper presented at the National Communication Association**, New York, NY (ERIC Document Reproduction Service No. ED430260).
- Bartlett, R. M., Cheng, S., & Strough, J. (2000, August). Multimedia versus traditional course instruction in under-graduate introductory psychology. **Poster presented at Annual American Psychological Association, Washington, DC.**

- Bartsch, R.A., & Cobern, K.M. (2003). Effectiveness of PowerPoint presentations in lectures. **Computers & Education**, 41, Pp.77–86.
- Beets, S.D., & Lobingier, P.G. (2001). Pedagogical techniques: Student performance and preferences. **Journal of Education for Business**, 76, Pp. 231–235.
- Billings, D. & Halstead, J. (1998). **Teaching in Nursing: A Guide for Faculty**. Saunders, Philadelphia.
- Blalock, M. G. and Montgomery, R. D. (2005). The effectiveness of PowerPoint on student performance in principles of economics: an exploratory study, **Journal for Economics Educators**, 5:3, Pp.1–7.
- Brown, G. & Atkins, M. (1988). **Effective Teaching in Higher Education**. London, Routledge.
- Cassady, J. C. (1998). Student and instructor perceptions of the efficacy of computer-aided lectures in undergraduate university courses. **Journal of Educational Computing Research**, 19, Pp.175–189.
- Craig, R. J. and Amernic, J. H. (2006). PowerPoint presentation technology and the dynamics of teaching. **Innovation in Higher Education**, 31, Pp.147-160.
- Daniels, L. (1999). Introducing technology in the classroom: PowerPoint as a first step. **Journal of Computing in Higher Education**, 10:2, Pp.42-56.
- Daniels, L., J. Kane, and B. Rosario (2007). The impact of PowerPoint on student performance, course evaluations, and preferences in economics courses: Experiment at three institution, **paper presented at the annual meetings of the allied social science association**, Chicago.
- Debevec, K., Shih, M.-Y., & Kashyap, V. (2006). Learning strategies and performance in a technology integrated classroom. **Journal of Research on Technology in Education**, 38:3, Pp.293-307.
- Estes, A., Ressler, S., Welch, R. & Hanus, J. (2009). Seminar on communication skills. Exceed teaching workshop. (<http://www.asce.org/files/ppt/exceed/USMA-09-Seminar-VIChalkboard.ppt>).
- Evans, L. (1998). Preliminary study: Lecture versus PowerPoint. Retrieved on 11/9/2006. Available http://www.Kcmetro.cc.mo.us.longview/lect_ppt.htm
- Fedisson, M. Braidic, S. (2007). **PowerPoint Presentations Increase achievement and student attitudes Towards Technology**. **International Journal of Information and Communication Technology Education**, 3:4, Pp.64-75.
- Fehn, B. (2007). Composing visual history: Using PowerPoint slideshows to explore historical narrative. **International Journal of Social Education**, 22:1, Pp. 43-67.
- Freedman, K. (1989). Microcomputers and the dynamics of image making and social life in three art classrooms. **Journal of Research on Computing in Education**, 21:3, Pp.290-298.
- Grabe, M. (2005). Voluntary use of online lecture notes: correlates of note use and not use as an alternative to class attendance. **Computers & Education**, 44, Pp.409-421.
- Grimstad, K., & Grabe, M. (2004). Are Online Study Questions Beneficial? **Teaching of Psychology**, 31:2, Pp.143-146.
- Harknett, R. J., & Cobane, C. T. (1997). Introducing instructional technology to international relations. **Politics Science & Politics**, 30, Pp.496-500.
- Haugland, J.L. (1997). Using Computer Technology and Course Web pages to Improve Student

- Performance in Accounting Courses. http://economocs_semo.edu/jhaugland.
- Hilton & Christensen (2002). **Evaluating the impact of multimedia lectures on student learning and attitudes**. ICOTS6.
- Jandaghi, G. & Matin, H.Z. (2009). Achievement and satisfaction in a computer-assisted versus a traditional lecturing of an introductory statistics course. **Australian Journal of Basic and Applied Sciences**, 3:3, Pp.1875-1878.
- Jensen, R. E., & Sandlin, P. K. (1992). Why do it? Advantages and dangers of new waves of computer-aided teaching/instruction. **Journal of Accounting Education**, 10, Pp.39-60.
- Kask, S. (2000, January). The impact of using computer presentations (CAP) on student learning in the microeconomics principles course. **Paper presented at the meeting of the American Economic Association**, Boston.
- Koeber, C. (2005). How Technology Affects Student Perceptions of Teaching Effectiveness. **Teaching Sociology**, 33:3, Pp.285-300.
- Lawler, E.M., Mara Chen, X. and Venso, E.A. (2007). Student Perspectives on Teaching Techniques and Outstanding Teachers. **Journal of the Scholarship of Teaching and Learning**, 7:2, Pp.32 - 48.
- Lewis, M.M., Moses, E.M. and Silverman, S.B. (2005). The Impact of Teaching with Technology on Student Learning, Multimedia Self-Efficacy, and Teacher Evaluations: An Empirical Study. **Journal of Cognitive Affective Learning**, 2:1, Pp.10-15.
- Lowry, R.B. (1999). Electronic presentation of lectures – Effect upon student performance. **University Chemistry Education**, 3, Pp.18–21.
- Mantei, E.J. (2000). Using internet class notes and PowerPoint in physical geology lecture: Comparing the success of computer technology with traditional teaching techniques. **Journal of College Science Teaching**, 29, Pp.301–305.
- Mason, R., & Hlynka, D. (1998). 'PowerPoint' in the classroom: Where is the power? **Educational Technology**, 38:5, Pp.42-45.
- Miller, R. B., & McCown, R. R. (1986). Effects of text coherence and elaboration on recall of sentences within paragraphs. **Contemporary Educational Psychology**, 11, Pp.127–138.
- Moreno, R., & Mayer, R. E. (2000). A coherence effect in multimedia learning: the case for minimizing irrelevant sounds in the design of multimedia instructional messages. **Journal of Educational Psychology**, 92, Pp.117–125.
- NCERT (2005). **National Curriculum Framework-2005**, New Delhi.
- Perry, T., & Perry, L. A. (1998). University students' attitudes towards multimedia presentations. **British Journal of Educational Technology**, 29, Pp.375–377.
- Race, P. (2007). **The lecturer's toolkit: a practical guide to learning**, third ed. Teaching and Assessment Routledge, London.
- Ramsden, P. (2003). **Learning to teach in higher education**, second ed. Routledge Palmer, London.
- Rankin, E.L., & Hoas, D.J. (2001). The use of PowerPoint and student performance. **Atlantic Economic Journal**, 29, 113.
- Shallcross, D.E. and Harrison, T.G. (2006). Lectures: electronic presentations versus chalk and talk – a

- chemist's view. **Chemistry Education Research and Practice**, 8:1, 73-79.
- Smith, S. M., & Woody, P. C. (2000). Interactive effect of multimedia instruction and learning styles. **Teaching of Psychology**, 27, Pp.220-223.
- Stephenson, J.E., Brown, C., Griffin, D.K. (2008). Electronic delivery of lectures in the university environment: An empirical comparison of three delivery styles. **Computers & Education**, 50, Pp.640–651.
- Stoloff, M. (1995). Teaching physiological psychology in a multimedia classroom. **Teaching of Psychology**, 22, Pp.138–141.
- Sugahara, Satoshi and Boland, Gregory (2006). The Effectiveness of PowerPoint presentations in the Accounting Classroom. **Accounting Education**, 15:4, Pp.391 – 403.
- Susskind, J., & Gurien, R. A. (1999, June). Do computer-generated presentations influence psychology students' learning and motivation to succeed? **Poster session presented at the annual convention of the American Psychological Society**, Denver, CO.
- Susskind, J.E. (2005). PowerPoint's power in the classroom: Enhancing students' self-efficacy and attitudes. **Computers and Education**, 45, Pp.203–215.
- Szabo, A., & Hastings, N. (2000). Using it in the undergraduate classroom: Should we replace the blackboard with PowerPoint? **Computers & Education**, 35, Pp.175–187.
- Weatherly, J. N., Grabe, M., & Arthur, E. I. L. (2002-2003). Providing Introductory Psychology Students Access to Lecture Slides via Blackboard: A Negative Impact on Performance. **Journal of Educational Technology Systems**, 31:4, Pp.463-474.
- Weinraub, H. J. (1998). Using multimedia authoring software: The effects on student learning perceptions and performance. **Financial Practice and Education**, 8: 2, Pp.88-92.
- West, R. L. (1997). Multimedia presentations in large classes: a field experiment. **Paper presented at the Annual Convention of the American Psychological Society**, Washington, DC.
- Wilmoth, J., & Wybraniec, J. (1998). Profits and pitfalls: Thoughts on using a laptop computer and presentation software to teach introductory social statistics. **Teaching Sociology**, 26, Pp.166-178.