ISSN: 1545-679X

Information Systems Education Journal

Volume 1, Number 29 http://isedj.org/1/29/ December 27, 2003

In this issue:

Meeting the Challenges of the 21st Century: Examining the Impact of the Laptop Teaching/Learning Environment on Deep and Surface Learners - Initial Findings

Franklyn Prescod
Ryerson University
Toronto, Ontario, M5B 2K3, Canada

Abstract: The implementation of the laptop program at Ryerson University provides a basis for further research on learning styles in this technology enabled environment. In particular, the impact of this laptop teaching/learning environment on deep and surface learners is the subject of a longitudinal study. The purpose of this paper is to share initial findings and observations on the data collected from the 1st group of students enrolled in the program and to invite comments for the next stage of data collection and analysis.

Keywords: deep learners, surface learners, laptop, computer attitude questionnaire, information and communication technology

---

Recommended Citation: Prescod (2003). Meeting the Challenges of the 21st Century: Examining the Impact of the Laptop Teaching/Learning Environment on Deep and Surface Learners - Initial Findings. *Information Systems Education Journal, 1* (29). http://isedj.org/1/29/. ISSN: 1545-679X. (Also appears in *The Proceedings of ISECON 2003:* §2124. ISSN: 1542-7382.)

This issue is on the Internet at **http://isedj.org/1/29/**

The **Information Systems Education Journal** (ISEDJ) is a peer-reviewed academic journal published by the Education Special Interest Group (EDSIG) of the Association of Information Technology Professionals (AITP, Chicago, Illinois). • ISSN: 1545-679X. • First issue: 2003. • Title: Information Systems Education Journal. Variant titles: IS Education Journal; IS Ed Journal; ISEDJ. • Physical format: online. • Publishing frequency: irregular; as each article is approved, it is published immediately and constitutes a complete separate issue of the current volume. • Single issue price: free. • Subscription address: subscribe@isedj.org. • Subscription price: free. • Electronic access: http://isedj.org/ • Contact person: Don Colton (editor@isedj.org)

The Information Systems Education Conference (ISECON) solicits and presents each year papers on topics of interest to IS Educators. Peer-reviewed papers are submitted to this journal.

EDSIG activities include the publication of ISEDJ, the organization and execution of the annual ISECON conference held each fall, the publication of the Journal of Information Systems Education (JISE), and the designation and honoring of an IS Educator of the Year. • The Foundation for Information Technology Education has been the key sponsor of ISECON over the years. • The Association for Information Technology Professionals (AITP) provides the corporate umbrella under which EDSIG operates. AITP celebrates its 50th year as a professional society in 2003.

Meeting the Challenges of the 21st Century: Examining the Impact of the Laptop Teaching/Learning Environment on Deep and Surface Learners – Initial Findings

Franklyn Prescod
School Of Information Technology Management
Ryerson University
350 Victoria Street
Toronto, Ontario, M5B 2K3, Canada
fprescod@.ryerson.ca

Abstract

The implementation of the laptop program at Ryerson University provides a basis for further research on learning styles in this technology enabled environment. In particular, the impact of this laptop teaching/learning environment on deep and surface learners is the subject of a longitudinal study. The purpose of this paper is to share initial findings and observations on the data collected from the 1st group of students enrolled in the program and to invite comments for the next stage of data collection and analysis.

Keywords*:* deep learners, surface learners, laptop, computer attitude questionnaire, information and communication technology.

1. INTRODUCTION

The purpose of this research is to investigate the effectiveness of the laptop enhanced teaching/learning environment on Deep and Surface Learners. The objective of this paper is to share the initial findings of the first stage in this longitudinal study of undergraduate students enrolled in the laptop program at Ryerson University. According to Denton and Mockford (1998), deep learners tend to take a holistic approach to learning, whereas surface learners focus on learning strategies in order to accomplish immediate results. In the laptop environment, at Ryerson University, students and faculty are provided with laptop computers equipped with wireless capability. These computers are configured with a variety of hardware and software to support the teaching/learning process, many factors in the environment. Research has shown that students have a tendency to adapt either a deep approach or a surface approach to their learning strategy (King, 2002). However, the question as to how the laptop enhanced program at Ryerson impacts deep and surface learners remains an interesting question. It is on this question that the study focuses attention.

Arguably, the pervasive use of technology in the classroom has the potential to increase the volume of material delivered to students. What needs to be ascertained is whether this

new capability contributes to the effectiveness and efficiency of contemporary pedagogy as it relates to deep and surface learners.

2. LITERATURE REVIEW

The use of information technology to enhance the teaching/learning process is continuing to engage the research community. As universities and colleges struggle with a shortage in resources, these organisations look to internet technology as a means to deliver a variety of programs. In the educational circles, it is a generally accepted notion that the advancement in technology contributes significantly to the improvements in learning and instruction. For instance, Demetriadis, Pomportsis & Traintafillou (2003) emphasize that in many countries the introduction of Information and Communication Technology (ICT) into schools has been praised as the necessary course of action for the qualitative improvement of teaching and learning methodology. However, thorough teacher preparation in the effective use of technology is essential to the effectiveness of this strategy.

The extent to which teachers and students embrace technology, as a complimentary component to learning styles, is a function of their comfort level with the technology (Verillon 2000; Beyth-Marom, Chajut, Roccas, & Sagiv 2001; Newhouse, 2000). Further research also shows that some teachers have a positive attitude towards computers in the classroom, and the integration of the technology into teaching strategies and curriculum development (Kosakowski, 1998; King, 2002; Christensen & Knezek, 2002; Morales & Roig, 2002). On the other hand, there are teachers that display a negative attitude towards using technology in the classroom for various reasons ranging from teacher preparation and training in technology use, to insufficient time allocated to technology adaptation initiatives (Hua, B.& Lehman, J.D, 2003; Crawley, L., 2000). It is also important to note that students' learning styles and gender are compelling indicators of their ability to adapt to a computer-supported teaching/learning environment (Hakkarainen & Palonen, 2003).

3. POPULATION

The population for this study consists of a diverse group of undergraduate students at Ryerson University, School of Information Technology Management. Table 1 shows the age distribution and Table 2 shows the gender distribution.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AGE	83	19	29	20.47	1.564
Valid N (listwise)	83				

Female

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AGE	252	19	27	20.89	1.451
Valid N (listwise)	252				

Male

Table1.

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	F	83	24.8	24.8	24.8
	M	252	75.2	75.2	100.0
	Total	335	100.0	100.0	

Table2.

The average age of the population (approximately 21 years) suggests that these students should be computer savvy. According to the CAQ results, 8% of the students indicated that they experienced a "sinking feeling" when they think of using a computer. In contrast, 38% of the respondents indicated that they are comfortable with computers.

4. METHODOLOGY

4.1 Definition of Deep and Surface Learning

Researchers have sought to describe clearly identifiable, qualitative distinctions in student learning styles. Biggs (1994) identifies learning styles as "the way in which students go about their academic tasks, thereby affecting the nature of learning outcome." The most basic of these use the classifications of "deep learning" and "surface learning" (Entwistle & Ramsden, 1983; Marton & Säljö, 1984). For the purpose of this study, deep and surface learning are defined, as noted by Denton & Mockford, (1998), as follows:

> "*Deep learning* is based on high levels of intrinsic motivation, pursuing new ideas and materials through a variety of strategies in the search for understanding. The deep approach is the ideal model for learning, although student performance may not necessarily be recognized in the award of high marks during assessment. On the other hand,
> *Surface learning* occurs when the student simply puts in the minimal effort to avoid failure. There is a focus on assessment requirements and an early move to final prototype modeling on the basis of limited design decision making."

4.2 Survey Instrument

In this longitudinal study, it is crucial to ascertain the students' attitude to computers as the first step towards investigating how the laptop environment influences their learning styles. Accordingly, the initial methodology used to examine the research question was a survey technique similar to the Computer Attitude Questionnaire (CAQ) (see Appendix A) (Christensen and Knezek, 1996), to investigate the impact of information technologies on students' learning styles. The first section of the questionnaire requested the standard demographic information from 1st Year Information Technology Management (ITM) students, of the laptop program, surveyed: (1) Program Year, (2) Computer experience, (3) Computer use in the classroom, (4) Computer use at the beginning of the school year, (5) Computer training received, (6) Access to a computer at home, (7) Age. Please note that gender was captured in a subsequent section. The second section of the survey included 20 questions that reflected students' attitude towards computers and measured their responses using a five point Likert scale where: "A" represents "strongly disagree", "B" represents "disagree", "C" represents "agree", "D" represents "strongly agree", and "E" represents "not applicable". The third section of the survey included 10 questions that addressed the students "feelings" towards computers. The responses in this section were measured using a five point Likert scale where: "E" represented the least affective response and "A" represented the most affective response.

In the fourth section students were presented with 70 questions that addressed the

role of computers in their education, training and learning strategies. The students were presented with statements and they were asked to respond using the following 5 point Likert scale: "A" represents "strongly disagree", "B" represents "disagree", "C" represents "undecided, "D" represents "agree", "E" represents "strongly agree". The internal consistency reliability for the paired comparisons portions of the CAQ are thought to be quite high (> .80, See Table 5).

5. PROCEDURES

Subjects for this study were pre-assigned to the ITM 1st year core programs for the academic year 2002/2003 and placed into the laptop program. A total of 119 students from a possible population of 335 responded to the survey. These students were considered a convenience sample as this author's colleagues administered the survey to their respective sections. Every effort was made to ensure that each student participated in the survey once. It was possible to include the entire laptop cohort for 2002/2003 as the population for the study.

The response rate to the survey was relatively high as students respond to the questionnaire at the start of their regularly scheduled lecture session or towards the end of a lecture session.

6. RESULTS

The total number of questionnaires distributed was 160 with a 74% response rate. The timing of the survey and the quantity of questions on the questionnaire were limiting factors on the effectiveness of the response. The survey was administered towards the end of the semester when the students were preoccupied with preparation for final examinations. In addition, most students noted that the questionnaire was too lengthy.

The process of investigating the impact of laptop computers on deep learners begins with analyzing the students' attitude towards computers (See Table 3 in the Appendix). 43% of the respondents agree that it is important to learn to use the computer. While, 47% indicated that computers give them "an opportunity to learn new things". However, only 5% of students agreed that they will "work harder if they can use computers more often". What will motivate the other 95% of the students to work harder other than more access to computers? This author argues that identifying the students' learning styles and adapting the laptop teaching/learning environment to facilitate these styles will significantly contribute to improvement the students' academic performance.

In addition to the students' attitude towards computers, their achievement as measured by their grade point average (GPA) is also extremely important. At the end of the 1st year, the Mean student GPA was approximately 2.3 (See Table 3).

7. CONCLUSIONS AND IMPLICATIONS FOR FURTHER RESEARCH

Students in the laptop program tend to use their computers as a coping tool in order to manage the increase workload in this new technological era. The initial data collected also shows that there is a disproportionate representation of female in the Information Technology arena. The ITM enrolment for 2002/2003 shows that female students account for less than 25% of the cohort (See Table 2). Moreover, the average age between genders is comparable (See Table 1). The interesting question is; what is responsible for this gender gap in technology appreciation and its effective use in teaching and learning?

The gender distribution among Information Technology (IT) faculty seems to be one of the factors that ultimately influence the gender representation in the student population. Currently, at ITM female faculty account for 19% IT staff and male faculty account for 81%.

This researcher's next step is to administer a learning styles inventory to students in the program in order to analyse the impact of the laptop learning environment on deep and surface learners.

8. ACKNOWLEDGEMENTS

This author would like to thank the reviewers for providing constructive and insightful comments that help to enhance this paper.

This author would also like to thank Ryerson University Work Study Program for funding the research and ITM colleagues Alex Pevec and Aziz Guergachi for administering the CAQ survey.

APPENDIX

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
GPA	252	.87	4.17	2.3594	.60108
Valid N (listwise)	252				

Male

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
GPA	83	1.34	3.56	2.3459	.50031
Valid N (listwise)	83				

Female

Table 3.

Survey of Students' Attitudes towards Computers

Reading issues	A Strongly Disagree (%)	B Dis-agree (%)	C Agree (%)	D Strongly Agree (%)	E N/A (%)
1) I enjoy doing things on the computer.	76	3	5	13	3
2) I am tired of using a computer.	11	10	23	12	41
3) I will be able to get a good job if I learn how to use a computer.	4	3	8	16	67
4) I concentrate on a computer when I use one.	7	4	15	13	57
5) I enjoy computer games very much.	15	8	43	20	10
6) I would work harder if I could use computers more often.	68	11	8	5	4
7) I think that it takes a long time to finish when I use a computer.	76	8	5	3	3
8) I know that computers give me opportunities to learn new things.	11	6	21	47	7
9) I can learn many things when					

I use a computer.	18	11	25	36	2
10) I enjoy lessons on the Computer.	16	11	32	25	7
11) I believe that it is very important for me to learn how to use a computer.	11	8	19	43	9
12) I think that computers are very easy to use.	8	17	25	34	5
13) I feel comfortable working with a computer.	12	16	25	34	4
14) I get a sinking feeling when I think of trying to use a computer.	37	20	16	8	9
15) Working with a computer makes me nervous.	41	21	12	14	6
16) Using a computer is very frustrating.	34	24	13	16	7
17) I will do as little work with computers as possible.	31	25	20	13	3
18) Computers are difficult to use.	37	23	18	12	3
19) Computers do not scare me at all.	8	15	26	38	7
20) I can learn more from books than from a computer.	16	18	26	18	14
Computers are:					
21) Unlikable, Likable	29	18	18	5	5
22) Unhappy, Happy	20	14	28	7	7
23) Bad, Good	25	15	21	7	8
24) Unpleasant, Pleasant	25	15	18	9	8
25) Tense, Calm	21	16	24	6	6
26) Uncomfortable, Comfortable	19	13	25	8	7
27) Artificial, Natural	18	11	26	6	11
28) Empty, Full	17	13	24	10	5
29) Dull, Exciting	24	8	22	10	6
30) Suffocating, Fresh	20	14	23	8	5

Table 4.

Table 2. Internal Consistency Reliability for 8-Factor Structure of the CAQ

Subscales	Alpha	No. of Variables
F1 (Computer Importance)	.82	7
F2 (Enjoyment)	.82	9
F3 (Motivation)	.80	9
F4 (Study Habits)	.82	10
F5 (Empathy)	.87	10
F6 (Creativity)	.86	13

F7 (Anxiety)	.84	8
F8 (Seclusion)	.81	13

Hopson, Michael H. (1998). Effects of a technology enriched learning environment on student development of higher order thinking skills. p. 35. Doctoral dissertation, University of North Texas, Texas. Permission granted.

Table 5.

9. REFERENCES

Beyth-Marom, R., Chajut, E., Roccas, S. & Sagiv, L., (2001). *Internet-assisted versus Traditional Distance Learning Environments: Factors Affecting Students' Preferences*. Computers & Education, 41, 65-76

Biggs, J. (1994). *Approaches to learning: Nature and measurement of. In T. Husen and T.N. Postlethwaite (Eds.)*, The international encyclopedia of education (2nd ed., Vol. 1) (pp. 319–322). Oxford: Pergamon.

Christensen, R. & Knezek, G., (2002). *Impact of New Information Technologies on Teachers and Students*. Education and Information Technologies, 7(4), 369-376.

Christensen, R. & Knezek, G., (1996). *Validating the Computer Attitude Questionnaire.* New Orleans: Southwest Educational Research Association Annual Conference.

Crawley, L. (2000, July 14). *Leading Teachers into Technology*. Retrieved from the World Wide Web: http://www.usoe.k12.ut.us/

Demetriadis, S., Pomportsis, A. & Traintafillou, E., (2003). *The Design and the Formative Evaluation of an Adaptive Educational System Based on Cognitive Styles*. Computers & Education, 43, 87-103.

Denton, H. & Mockford, C., (1998). *Assessment Modes, Learning Styles, and Design and Technology Project work in Higher Education.* The Journal of Technology Studies, 24(1), 12-18.

Hakkarainen, K. & Palonen, T., (2003). *Patterns of Female and Male Students' Participation in Peer Interaction in Computer-Supported Learning*. Computers & Education, 40, 327-342.

Hua, B. & Lehman, J.D., (2003). *Impact of Professional Development Project on University Faculty Members' Perceptions and Use of Technology*. United States: Purdue University.

King, K. (2002). *Educational Technology Professional Development as Transformative Learning Opportunities.* Computers & Education, 39, 283-297.

Knezek, G. & Christensen, R. (2000), *Impact of New Information Technologies on Teachers and Students, Education and Information Technologies* 7:4, 369–376, 2002. Kluwer Academic Publishers,The Netherlands.

Kosakowski, J. (1998). *The Benefits of Information Technology. Clearinghouse on Information & Technology*. Retrieved from the World Wide Web: http://www.ericit.org/index.shtml

Morales, L. & Roig, G., (2002). *Connecting a Technology Faculty Development Program with Student Learning*. Campus-Wide Information Systems, 19(2), 67-72.

Marton, F. & Säljö, R. (1984). Approaches to learning. In F. Martin, D. Hounsell, & N. J. Entwistle (Eds.), *The experience of learning*. Edinburgh, Scotland: Scottish Academic Press.

Newhouse, P. (2000, June 23). *Development and Use of an Instrument for Computer-Supported Learning Environments*. Learning Environments Research, 4, 115-138.

Entwistle, N. J. & Ramsden, P. (1983). *Understanding student learning*. London: Croom Helm.

Verillon, P. (2000). *Revisiting Piaget and Vigotsky: In Search of a Learning Model for Technology Education*. The Journal of Technology Studies, 26(1), 3-10.

Franklyn I. Prescod is an Assistant Professor at Ryerson University. He earned a B.A.A in Administration and Information Management from Ryerson University and an M.Sc. in Telecommunications and Network Management from Syracuse University. Assistant Professor Prescod teaches in the areas of Network Technology, Business Information Systems, Telecommunications Technologies & Applications and eBusiness. His research interests include technology-enabled pedagogy and the impact of technology on learning styles. He also conducts research in eCommerce with a focus on the comfort level of senior citizens in the digital economy. Prior to becoming part of the Ryerson community, Assistant Professor Prescod spent over two decades teaching and working in industry as an information technology analyst.