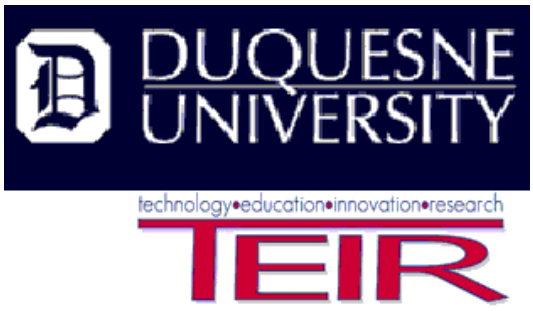
INTERNATIONAL JOURNAL OF INSTRUCTIONAL TECHNOLOGY AND DISTANCE LEARNING

August 2004

Volume 1 Number 8

ISSN 1550-6908



PUBLISHER'S DECLARATION

This Journal was established to facilitate collaboration and communication among researchers, innovators, practitioners, and administrators of education and training programs involving technology and distance learning.

An academic institution, Duquesne University, was chosen for its commitment to academic excellence and exemplary programs in instructional technology and distance learning. Duquesne University is supporting the Journal through its graduate program in Instructional Technology and its Center for Technology Education Innovation and Research (TEIR Center). In addition to its educational programs, Duquesne University has major training contracts for industry and government.

The Journal is refereed, global, and focused on research and innovation in teaching and learning. Duquesne University and its partner, DonEl Learning Inc., are committed to publish significant writings of high academic stature.

Lawrence A. Tomei, EdD
Executive Director, Center TEIR

Additional information for authors, sponsors, and readers is on the Journal webpage at
http://itdl.org

International Journal of
Instructional Technology & Distance Learning
Vol 1. No. 8. ISSN 1550-6908

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Editorial:
The Center for Technology Education Research and Innovation (TEIR)

Lawrence A. Tomei, EdD
(IJITDL Publisher)

Congratulations to Don Perrin, the staff of the editorial review board, and the contributing authors who have made the International Journal of Instructional Technology and Distance Learning a success. In just a few months, we have taken the IJITDL from a dream to a reality while expanding upon a reputation that will make it the premier publication for distance education professionals.

First-time readers may wonder about the ***Center for Technology Education Research and Innovation*** and why it is sponsoring (i.e., publishing) the IJITDL. The TEIR Center was established in 2003 at Duquesne University in Pittsburgh PA to explore three pivotal and inexorably interrelated aspects of instructional technology. The Center quickly established a partnership with DonEl Learning Inc. and assumed overall publishing responsibilities for the IJITDL. Since then, it has initiated three strategic projects to build excellence in technology for teaching and learning.

Education.

Our highly effective SUCCESS program is the pivotal educational program. Working under sponsorship from the Ira V. Heinz Endowments, Duquesne University's School of Education, and the Western Pennsylvania Catholic Schools Consortium, TEIR has implemented a three-year program for integrating technology into K-12 schools. Year One of SUCCESS focuses on teacher preparation, beginning with a five-day summer workshop that guides participating teachers through the creation of text, visual, and web-based instructional materials. Returning to their classrooms, teachers continue to receive hands-on tutorials from their own technology advisor (a graduate student from Duquesne's Program in Instructional Technology). Their task is to complete the technology-based lesson begun in the summer workshop and deliver the lesson to students under the observation of their principal. Year Two of SUCCESS addresses the school's curriculum in an effort to integrate technology standards, skills, and competencies. Year Three completes the journey by placing into service a mobile videoconferencing system along with membership in our Schools Distance Learning Network. For more information about the Model for Integrating Technology into K-12 Schools, visit our SUCCESS web site or contact Duquesne University's Program in Instructional Technology at itechnology@duq.edu.

Innovation.

The TEIR Center emerged from its Year Three work with SUCCESS to partner with the Challenger Learning Center (CLC) program at Wheeling Jesuit University in Wheeling VA. "During CLC missions, students return to the moon, voyage to mars, or explore Earth from space. Students in Mission Control direct the critical activities of the students on board the space station-navigation, maintaining life support systems, communicating, or conducting research. The students experience the critical thinking, leadership, cooperation, and problem solving challenges necessary for mission success." (http://www.wju.edu/clc/main.html). SUCCESS uses middle and secondary school E-missions to provide an initial online curriculum for its video-based distance program.

Most teachers immediately recognize that an elementary-level focus is missing. In collaboration with the Challenger Learning Center, the TEIR Center was contracted to develop the Moon, Mars, and Beyond E-mission for grades 3-5. Innovative applications of technology are integral to the mission of the TEIR Center.

Research.

The third arm of TEIR involves the conduct of scholarly investigations to advance best practices in instructional technology. Certainly, the IJITDL is the digital manifestation of the Center's commitment to research. It was established to facilitate collaboration and communication among researchers, innovators, practitioners, and administrators of education and training programs involving technology and distance learning. In addition, TEIR conducts numerous investigations into the practice of teaching and learning with technology. One particularly important cadre of contributors is Duquesne's own Doctor of Education in Instructional Technologies (EdDIT) program. Its 30-plus participants conduct inquiries into the applications of technology and will share their findings with future IJITDL readers.

The TEIR Center partners with local technology partners including Three Rivers Connect (3RC), Inspiration Point, and various public school districts. The mission of 3RC is to "accelerate economic, social, and educational development through the innovative uses of information technology" (http://www.3rc.org/). Inspiration Point offers a wide range of conference services focusing on technology planning, cost reduction strategies, strategic planning and general training needs (http://www.inspiration-point.com). Several private and parochial schools have aligned themselves with Duquesne University via the Enhancing Education Through Technology (EETT) federal grant. EETT increases student achievement through the effective integration of technology into curricula and instruction; the foresight of its authors ensures that a full 40 percent of allocated funds must be earmarked for teacher in-service training. A partnership between these schools and the SUCCESS program involves some 30 schools and over 680 teachers in the SUCCESS-ful integration of technology into the classroom.

From its inception, the scope of the TEIR Center has been international focusing on all levels and all forms of instructional technologies. The result of these and other endeavors will appear in subsequent issues of IJITDL.

Exciting times are in store for readers and contributors of IJITDL. You are encouraged to submit not only your own manuscripts for consideration, but to encourage others to do so as well. Only by making the International Journal of Instructional Technology and Distance Learning your technology journal will we collectively be able to advance instructional technology as a viable strategy for teaching and learning.

Editor's Note: Students who are able to attend traditional universities value the face-to-face contacts with their professors and fellow students. Nevertheless, advantages of technology are being introduced into traditional academic institutions and curricula. This study of on-campus students in one large university in the United Kingdom shows a strong interest in retaining lectures and other aspects of learning in a brick-and-mortar university. It also shows extensive use of email, cell phones, and other learning technologies.

Student Attitudes Towards Information and Communication Technologies in Teaching and Learning in the UK

Gunter Saunders and Anita Pincas

Abstract

Intensive government funded drives to achieve digital or e-literacy on our college campuses are still regarded with some skepticism among both students and staff. We are here reporting on a survey of 1400 students at one of the larger UK universities, the University of Westminster in London. We outline student responses to questions about their own learning and their assessment of the value of ICT in helping them to manage their studies. Our results are not surprising, but lead to further insights about how we college teachers can link our efforts to student perceptions of the many initiatives we undertake, especially in using ICT for teaching and learning.

Introduction

Almost all universities in the UK are trying to develop the use of information and communication technology (ICT see UCISA 2003), and especially virtual learning environments (VLEs) to underpin teaching and learning (Saunders 2002, Jenkins *et al*., 2003,). Much of the activity is aimed towards support for students who are still required to attend face-to-face classes on a regular basis.

There are many drivers and justifications for this activity, some of which relate to the experiences and lifestyles of university students. For example young school leavers are now coming to university having frequently taken part in classes at school that make extensive use of technology (Pittard et al., 2003). Mature students, who are or may have been in employment, are quite likely to understand the significance of technology for their future career and will increasingly expect to experience its use across all subjects in higher education. In addition it is often predicted that students will require more flexible patterns of attendance as they try to balance their education against family priorities and commitments and/or earn the money that they need to pay for their education (Butzin 2000, Reiser 2001, Hoffman 2002).

There are 2 major aspects to the developments in the use of ICT at universities in the UK. One is concerned with the enhancement of ways in which 'teaching associated' activities (e.g. basic communication and the provision of information to students, the processing of assessed work, conduct of short answer tests) are conducted (Zakrzewski and Bull 1998, Pitcher et al., 2002, Thomas and Paine 2003). Very few staff or students at a campus based university will have much argument over the desirability for more efficient academic administrative functions. The other aspect, the case for using ICT to deliver or part deliver the academic components of a course is harder to argue. Despite the exhortations of government about the importance of e-learning to

everyone or the much promoted need to respond to the changing circumstances of students by providing increasingly flexible courses, the questions of exactly why and how one should integrate ICT onto an existing face-to-face course are sometimes hard to answer (Saunders 2002, Darking 2002, Butler and Sellbom 2002).

Over the past few years there have been many reports published of individual subject specific case studies indicating that the integration of ICT into a face-to-face courses can have positive effects on learning outcomes (see for examples, Housego and Freeman 2000, Phillips 2000, Heines 2000, Aberson et al., 2000, Diochon and Cameron 2001, Saunders and Klemmif 2003). Many such studies have however focused primarily on outcomes on overall student performance. In contrast there have been few investigations that have set out to find out from students how they feel ICT should be used to support their learning on a face-to-face course. Indeed, the major preoccupation has been with staff-engagement activities (Collis & Moonen 2001). While student perceptions are not based on informed understanding of their own learning processes, and still less of principles of teaching, they are nevertheless a crucial, personal response to our efforts that we ignore at our peril.

This paper reports students' views on how technology is or should be integrated with face-to-face teaching. It also elicited views on aspects of existing face-to-face teaching practice. The population covered by the survey included undergraduate, postgraduate, full-time and part-time students from a wide range of subject areas.

Context and Research approach taken

The University of Westminster is based in the centre of London and over 50% of its students study part-time. The great majority of courses offered are classroom based (Westminster has only a few hundred students taking distance courses). The University started to use a VLE in a strategic manner to support its courses approximately eighteen months ago.

The survey was based on a detailed web based questionnaire which was completed by 967 students during a 4 week period in November/December 2003. The 34 questions were broken down broadly into 4 sections designed to elicit information and views on:

- Student ownership and use of personal computers
- Student use of email and the Internet generally
- Attitudes towards face-to-face teaching
- Attitudes towards the use of online materials and approaches

In addition, information about a student's course, mode of study (full-time, part-time, postgraduate/undergraduate), their personal circumstances (for example did they live at home, how many hours a week did they spend in paid employment and studying) was also collected.

A further 395 students who had not completed the online questionnaire were interviewed face-to-face to ensure there was no bias in favour of students more pre-disposed to the use of technology. Their responses supported the results of the online survey that are detailed below.

The online questionnaire required a mix of yes/no, tick box and free text answers. In the analysis presented below, where data is derived from yes/no or tick box, percentage figures are presented. Answers to open ended questions were analysed through content analysis into major themes. In these cases more qualitative conclusions are drawn and percentage figure are not presented.

About the student population surveyed

Of the respondents to the survey 34.8% were postgraduates and 65.2% were undergraduates. The majority of undergraduates surveyed were studying full-time (80.3%) whilst postgraduate respondents were fairly evenly split between the 2 modes of study (40.5% full-time, 59.5% part-time). The distribution of respondents across major subject areas within the University is shown in table 1.

Table 1
Distribution of respondents across major subject areas

Subject Area	Percentage of respondents
Business & Management	20.0
Media, Art & Design	12.6
Biosciences/Health Sciences	9.0
Built Environment	12.1
Languages	16.0
Social Sciences	12.9
Computer Science	17.5
Law	7.8

Thirty per cent of the students surveyed stated that they lived at their parents' home during term time, with the bulk of these (86%) being undergraduate students. Full-time students indicated that they undertook paid employment in addition to attending university for between 5 - 40 hours per week, with the average being 15 hours of paid employment per week. Respondents also estimated how much time on average they spent on their studies outside of class each week (see table 2).

Table 2
Average hours per week studying outside of the classroom
(FT Full-time mode, PT Part-time mode)

Student type	Average hours (FT)	Average hours (PT)
Postgraduate	21	10
Undergraduate	14.5	11.5

Students' ownership and use of personal computers

Eighty-one per cent of students had access to a personal computer (PC) off campus at their term-time address[1]. Of the 19% without a PC 33% were postgraduates and 30% were part-time students. Ninety-seven per cent described themselves as regular email users. Nearly 50% of respondents stated that their main use of email was to maintain contact with tutors or for some other purpose related to their studies (e.g. exchanges of ideas and information with fellow students). Around two-thirds of respondents (59% of all postgraduates and 72% of all undergraduates) had used the Internet previously to support their studies whilst at school. Eighty per cent stated that they searched the Internet for information related to their studies at university

[1] Note this would include students in the University Halls of Residence but all PCs in hall are student owned and not provided by the University.

on a regular basis, citing assignments/coursework as the major 'trigger' for Internet searches. There was some variation in the extent to which students used the Internet across subject areas with students from languages and health sciences for some reason less likely to turn to the Internet regularly than students from the business or law schools. Approximately half of the respondents had not experienced the use of the institutional virtual learning environment so far in their studies at university.

The respondents most positive about searching for information on the Internet to help them with assignments cited several advantages of the Internet over books including the accessibility of the information and the fact that the information could be more up-to-date than that found in printed works. Students also clearly valued the speed with which factual questions could be answered and a number also explained how valuable the Internet was in circumstances where one was starting from 'scratch' on a subject.

However, many respondents made reference to the use of books and overall there was the impression that a majority saw use of the Internet as a 'supplement' to the use of books. There was a roughly even split between those who used the Internet first and then went to books and those who saw the Internet as a resource to be used after they had done some preliminary research through books or journal articles.

Attitudes towards flexibility and lectures

When asked if they would rather attend classes every other week as opposed to every week, 82% of the respondents said no. Many felt that this would lead to a loss of study routine and continuity and that they would accordingly do less work in the intervening weeks. More significantly the importance of personal contact to the education process, including interaction with fellow students was strongly highlighted. The classroom was seen as the place to ask questions of the tutor and to seek clarification.

The 18% who answered that they would prefer classes every other week, mainly cited pressures of combining home/work with study i.e. family demands (young children). There was no significant 'study mode' bias amongst the 18% (34.5% were part-time students compared to 33.5% across the total number of respondents). However, part-time students were more inclined to refer to study at home and some could see the occasional classroom session serving as a 'check' for independent work. Full-time students indicating a preference for fewer classes more commonly felt that having more time to research for coursework/projects and to reflect would be of value to them.

Forty-five per cent of respondents indicated that they would prefer to have more face-to-face lectures at university. A number of explanations were given for this but the most common theme among both undergraduates and postgraduates (FT and PT) was once again a strongly felt requirement for personal contact with tutors/lecturers and/or fellow students and the learning benefits derived from that contact. A second often cited theme was simply that respondents felt that lectures were better than alternatives (e.g. e-learning approaches, tutorials, seminars were specifically mentioned). Only one group of students, first year undergraduates, suggested in free text comments that they learned better from lectures than from other forms of teaching.

The most common explanation amongst the fifty-five per cent of respondents who stated that they did not want more lectures was that they needed more time for independent forms of study through the research and reading required to complete coursework. Almost as many said in some way that they preferred more interactive sessions (e.g. seminars/tutorials) or that lectures were boring. Similar numbers cited problems with attending university (travel time/costs, need to work) as a reason for not wanting more lectures. Problems of attendance were not confined to part-time students. Full-time undergraduates just as frequently mentioned difficulties in attending university on a regular basis.

Attitudes towards the use of online materials and approaches

The questionnaire included 3 specific questions around the issue of the use of online learning approaches to support and/or replace face-to-face activity. The three questions and the percentage responding yes or no to each are shown in table 3. For all 3 questions shown in table 3 there was no detectable bias towards undergraduate versus postgraduate or full-time versus part-time. Similarly there was no significant subject related bias with the possible exception of the Social Sciences where students appeared to be more positive towards the use of ICT whereas students taking a language were inclined to be more negative.

Table 3
Percentage yes or no responses to 3 questions about online learning

Question posed	Yes	No
1. Do you think that certain online activities (like discussion boards, online conferences short answer tests) can sometimes be an alternative to face-to-face classes?	46.5%	53.5%
2. Do you think that there are certain things that you currently do in face-to-face classes that might be better done online?	36%	64%
3. Do you think that combining face-to-face classes with online activities (e.g. discussion boards, short answer tests) is potentially useful?	82%	18%

Respondents were asked to explain their reason(s) for answering Yes or No to the questions in the table above. Most expressed the view that the use of online methods should/must be seen as complementary to face-to-face classes and activities. Frequently, respondents specifically stated that they either strongly supported the retention of current levels of face-to-face or opposed the introduction of online methods at the expense of face-to-face.

Common themes for the positive value of online approaches (primarily to support face-to-face rather than replace any of it) in order of frequency with which they were cited were:

1. Online approaches led to changes in learning providing:
    a. Greater stimulation
    b. More opportunities to understand
2. More opportunity to think and reflect possibly before contributing (some 14% of the comments (total number 580) analysed referred to the advantage of online activities to the ‘shy’ student, not keen to ask questions in class)
3. Online approaches helped to reinforce what was taught/learned in the classroom
4. Online approaches provided scope for class members to share knowledge more efficiently and effectively

Such comments are in line with similar reactions that have been consistently reported in the literature since online teaching began (early examples can be found in Hiltz & Turoff 1978; Pincas, A. 1994, 1997)

Almost half of the respondents who referred to changes in the way that learning could occur as a consequence of the use of online tools specifically mentioned the positive effect of the use of short answer tests as a supplement to classes. Comments about short answer tests ranged from self-assessment and monitoring of progress through to reinforcement and diagnosis of weaknesses.

Discussion and Conclusions

Students' current use of email and the Internet to support their studies is clearly high. It can be seen from the data obtained that a high proportion of the students surveyed are using email as a basic form of networked learning. Their use of the Internet to underpin the assignment process is significant as is the fact that many still see the significance of 'books' to the research process. Previous published work has also shown how students use the Internet in conjunction with books (Ray and Day 1998) which argues against the concerns of Lindsay and Mclaren (2000) that students may become too reliant on the Internet as a single source of information. What is also clear from the data obtained is that students are very clear about the advantages of using the Internet.

The students surveyed firmly believe themselves that ICT has a significant role to play in supporting and enhancing their university learning experience. Their comments also suggest that they see the use of ICT as potentially going well beyond the use of the Internet to search for resources and the use of email to stay in touch with tutors and fellow students. This is evidenced by the overwhelming majority responding yes to the question 'Do you think that combining face-to-face classes with online activities (discussion boards, short answer tests) is potentially useful'? In addition to this a significant number clearly felt that ICT could sometimes be used as an alternative to face-to-face activities. The very small subject specific or study mode bias observed in the answers given is in contrast to other work that has shown a more significant interest towards the use of ICT from students of some subject areas (Hong *et al*., 2003).

Students who were or already had experienced the use of a VLE on their course, were no more or less inclined to respond yes to the question above or to hold the view that some face-to-face could be replaced with online alternatives. In the main, students gave higher level reasons for their support of ICT. This is in contrast to a much smaller scale study of a subject specific group which indicated that students saw web based resources as something to be used solely to support revision prior to end of course examination (Saunders & Klemmif 2003).

A significant proportion of full-time students undertake an average of 14 hours per week paid employment. The same students estimate that they spend an average 14.5 hours on study outside of the classroom and, typically, would be expected to spend a further 12 hours in class per week. Part-time students are normally in full-time paid employment and attend university on a day release basis. It would appear therefore from the data on full-time students and the circumstances of part-time students, that both groups might have good reason to prefer more flexible modes of attendance and course delivery. Indeed, it was clear from a noticeable number of comments about lectures that a major reason for not wanting more lectures was associated with attendance difficulties.

Despite these apparent drivers for flexibility, and in contrast to their views on use of ICT, students overwhelmingly came out against the notion of holding face-to-face classes less regularly. The main reason for this was a clearly held view that face-to-face communication and events, with both academic staff and fellow students, was critical to their overall learning. The fact that they also felt that irregular classes would lead to loss of routine, continuity and motivation served to highlight the present perceived importance of face-to-face classes to campus based students.

Many courses rely heavily on the lecture as a means of presenting the information or existing knowledge that forms the basis for the overall delivery of the course. Previous substantial studies have shown why it is that students appreciate lectures (e.g. Brown and Daines 1981). Whilst the majority of students clearly did not want to see face-to-face contact reduced, a significant proportion also did not wish to see any further increase in the number of lectures they received. Although a number of respondents did indicate in some way that they preferred more interactive

forms of classroom based teaching, the need to have more time for independent study was also commonly raised. This may be linked to the major reasons that students gave for feeling that online activities should be combined with face-to-face classes, most of which related in some way to having greater opportunity to think about and reflect on what had taken place in class.

In conclusion, significant numbers of students are keen to see ICT exploited in the teaching and learning process. Indeed, the degree to which email, for example, is being used to maintain contact with tutors, alongside the use of mobile phones (especially sms/texting) between students, suggests that a form of ICT based networked learning is already significant. However, the same students are very reluctant to see face-to-face contact replaced with online alternatives. This is not too dissimilar to the situation with the majority of academic staff (Butler and Sellbom 2002, Saunders, Unpublished observations), many of whom believe that face-to-face interaction cannot be replaced effectively online.

We suggest that learners and teachers need to be persuaded that economic realities mean they cannot have both. If our higher education is to be effective, we have no alternatives but to harness the best of our ICT options. Further, we would argue that much of the hesitancy about digital learning methods is due to experience of less than ideal uses of these. If all that students and staff have experienced are online PowerPoint slides, or lists of urls, or text-lectures, or badly structured online discussion forums where interactions are sparse and ineffectual, then it is not surprising that they do not yet recognise the value of online methods.

Ardent supporters of the use of ICT have to meet the challenge of not only refuting this view, but also of demonstrating more acceptable, useful and affordable ways of integrating ICT into face-to-face courses. In a smaller scale survey, Williams (2002), like many others previously, shows how the use of web based materials by students is positively linked to performance and achievement. However that paper also states that students felt that the use of web based materials represented an abrogation of lecturers' teaching duties and led to more work for the student. The way forward is surely to present materials in more stimulating ways and focus on delivering the knowledge sharing and reflection opportunities that students are saying they value.

References

1. Aberson, C.L., Berger, D.E., Healy, M.R., Kyle, D.J. and V.L. Romero (2000) Evaluation of an interactive tutorial for teaching the central limit theorem, Teaching of Psychology, 27, 289-291.
2. Brown,G.A. and J.M.Daines (1981) Learning from lectures, In: E. Oxtoby (Eds) Higher Education at the Crossroads, Society for Research in Higher Education.
3. Butler, D.L. and M.Sellbom (2002) Barriers to adopting technology for teaching and learning, Educause Quarterly, 2, 22-28.
4. Butzin, S. M. (2000). Using instructional technology in transformed learning environments: An evaluation of project child. Journal of Research in Computing Education, 33(4), 367-384
5. Collis, B.. & Moonen J. (2001) Flexible Learning in a Digital World Kogan Page.
6. Darking, M. (2002) Integrating pedagogical technologies into UK Higher Education: Conceptual Foundations" 2002. In the proceedings of the Xth European Conference on Information Systems, Gdansk, Poland. Vol. 2, pp. 1430-1438.
7. Diochon, M.C. and A. F. Cameron (2001) Technology based interactive learning: designing and international student research project, 2, (2) 114-127.

8. Heines, J.M. (2000) Evaluating the effect of a course web site on student performance. Journal of Computing in Higher Education, 12, 57-83.

9. Hiltz, S. R. and Turoff, M. (1978) The network nation: Human communication via computer Addison-Wesley Publishing Company, Inc.

10. Hofmann, D. W. (2002). Distance learning in higher education. *Techdirections,* 28-32.

11. Hong, K.-S., Ridzuan, A. A., & Kuek, M.-K. (2003). Students' attitudes toward the use of the Internet for learning: A study at a university in Malaysia. Educational Technology & Society, 6(2), 45-49,

12. Housego, S. and Freeman, M. (2000). Case studies: Integrating the use of web based learning systems into student learning. *Australian Journal of Educational Technology*, 16(3), 258-282.

13. Lindsay, W. and S. Mclaren (2000) The Internet: an aid to student research or a source of frustration? Journal of Educational Media, 25, (2), 115-128.

14. Martin Jenkins, M., Browne, T. and Susan Armitage (2003), Management and implementation of Virtual Learning Environments: A UCISA funded survey. http://www.ucisa.ac.uk/groups/tlig/vle/index_html

15. Phillips, J.A. (2000). Teaching a graduate course using an on-site and on-line approach. *Proceedings of the International Conference on ICT in Education*. University Putra Malaysia. Kuala Lumpur. 123-130.

16. Pincas, A (1994) Learner collaboration in asynchronous computer conferencing courses Applied Learning Technologies in Europe (University of Erlangen) Vol. 8 p. 6.

17. Pincas, A. (1997) "Instructional Design for Group-Based Learning by Computer Conferencing in C. Bell et al (Eds.), Implementing Flexible Learning Kogan Page, pp.183-190, ISBN 0 7494 1874 5.

18. Pitcher, N., Goldfinch, J. and C. Beevers (2002) Active learning in higher education, 3, (2), 159-176.

19. Pittard, V., Bannister, P. and J. Dunn (2003) The big pICTure:The Impact of ICT on Attainment, Motivation and Learning, Report from the Department for Education and Skills, http://www.dfes.gov.uk/research/data/uploadfiles/ThebigpICTure.pdf

20. Ray, Kathryn & Day, Joan (1998) "Student attitudes towards electronic information resources." Information Research, 4(2) Available at: http://informationr.net/ir/4-2/paper54.html

21. Reiser, R. A. (2001). A history of instructional design and technology: Part 1: A history of instructional media. Educational Technology Research and Development, 49(1), 53-64.

22. Saunders, G. (2002) Introducing technology onto a traditional course: Turning the classroom upside down. The new educational benefits of ICT in higher education; Proceedings, Eds. A.J.Kallenberg and M.J.J.M. van de Ven, pp 38-44, Erasmus Plus

23. Saunders, G. (2002 Integrating technology into the activities of a traditional university: Facing up to the problems. The new educational benefits of ICT in higher education; Proceedings, Eds. A.J.Kallenberg and M.J.J.M. van de Ven, pp 159-165, Erasmus Plus..

24. Saunders, G. and Klemmif, F. (2003) Integrating technology into a traditional learning environment; Reasons for and risks of success. Active learning in higher education, 4(1),74-86.

25. Saunders, G. (2002) Integrating technology into the activities of a traditional university: Facing up to the problems. Eds. A.J.Kallenberg and M.J.J.M. van de Ven, pp 159-165, Erasmus Plus.

26. Saunders, G. and Pincas, A. (2003) Learning On Line on Campus, Learning Partners,UK

27. Smith, T. (2003) Ubiquitous Computing in Higher Education. Report from The Observatory on Borderless Higher Education.

28. Thomas, P. and C. Paine (2003) Evaluation of experiments with electronic marking of examinations. In: Proceedings of the 8th Annual Conference on Innovation and Technology in Computer Science Education, ITiCSE, Thesaloniki, Greece, July, 2003, pp 50-54.

29. Zakrzewski, S and Bull, J (1998) The Mass Implementation and Evaluation of Computer-based Assessments, Assessment and Evaluation in Higher Education, 23 (2) pp. 141 - 152.

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Editor's Note: This is a study of faculty preferences in five campuses of one Community College. It includes faculty and division chairpersons. Faculty data is differentiated by discipline as full time and part time, distance only, classroom only, dual assignments. It provides a snapshot in time of one academic institution.

Faculty Preferences for Course Delivery: Distance and Traditional Settings

Lisa O'Quinn and Michael Corry

Keywords: Faculty preferences, Course delivery methods, Distance Learning, E-learning, Face-to-face instruction, Traditional instruction, Distance vs. Face-to-Face Instruction,

> *"Learning is bursting its previous bounds, with more people gaining access to a wider range of people and things. And once again, the duration and pace of interaction – students with students, students with experts, students with academic resources are changing" (Ehrmann, 1999). Teaching via distance education requires not only that faculty learn how to use new technologies, it also requires a paradigm shift in how educators orchestrate the act of learning (Dillon and Walsh, 1992; Hassenplug and Harnish, 1998).*

Moore (1996) argues that instructors teaching in a distance learning mode need to engage their students in active learning through learner-content interaction, learner-instructor interaction and learner-learner interaction. Through these three modes of learning students become more self-directed and responsible for their own learning. Students create their own framework of knowledge or interpretation of information, and engage in questioning, discussion and exchange of interpretations with instructors and other learners.

The former model of the teacher-classroom experience will still continue, but it will not be the dominant medium of education. Technology can free faculty from the bounds of time and space, but only if they learn to measure their productivity in new ways, mainly by what students learn, instead of how they learn, where they learn, and for how long faculty teach them (Plater, 1999).

Grossman (1989) credits the secondary status that distance education receives at most institutions to higher education's failure of recognizing that the culture of distance education is at odds with the traditional academic culture. Grossman (1989) perceives the systems approach to course design and delivery as forcing faculty to relinquish their "intellectual proprietorship," which is highly valued within the culture of higher education and rewarded by the academy. This "systems approach" represents a new paradigm in teaching, as it requires a team of experts who can ensure that the components of distance education courses are fully integrated and complement each other.

However, this division of labor does not mean that faculty can completely rely upon instructional technologists to deliver their courses. On the contrary, faculty should be able to identify and recognize technologies' strengths and weaknesses and select the most appropriate delivery mechanism for a particular lesson (Gunawardena, 1992). More important, than just learning how to use the technology appropriately, faculty need to learn how to personalize their instruction, regardless of the technology they use, and incorporate student involvement activities into their instruction. Faculty who integrate collaborative learning in their distance education courses also use it in their classroom discussions and find it enables them to improve their classroom teaching as well (Dillon and Walsh, 1992; Wolcott, 1993).

When Carr (2001) interviewed a faculty member at Columbia University about his decision to transform his courses to a distance education medium he cited the different techniques he had to master. He spoke about how he missed the face-to-face contact with his students and the control he had over the flow of material which he presented to his students. As he began to teach his course on line he learned that many students don't learn in a linear fashion. He had to design his course in a manner that allowed them to gain access to content in a way that made sense to them.

As faculty continue to develop their teaching styles, they are like many other professionals, who are faced with the challenge of having to meet their ongoing responsibilities while simultaneously learning new technological skills and attempting to integrate them into their professional roles. When viewed from this perspective, faculty can be regarded as adult learners and faculty development can be considered as an "adult learning undertaking." (Gillespie, 1998). Many of the adult student characteristics noted by Knowles (1984) and Brookfield (1984) may also be applied to faculty. Knowles (ibid) and Brookfield (ibid) hold that the majority of adult learners can learn from each other through the sharing of their rich experiences. Adults also develop attitudes and values based upon their previous knowledge, values and experience. Steinhart (1988) found that faculty based their decision of participation in distance education upon the knowledge and experience they or their colleagues had gained in this delivery mode and their philosophy toward teaching.

In this regard, training programs instructional development programs and support services for faculty are vital, but they vary greatly across institutions (Gilcher & Johnson, 1989; Dillon, 1989; Kirby and Garrison, 1989; Scriven, 1986). McNeil (1990) found that even faculty who are most personally motivated to teach distance education will refrain from participating if they do not receive adequate support and instructional development.

Professional development programs for faculty should provide them with opportunities that will enable them to examine and discuss their attitudes toward distance education, adopt new pedagogies, and master the use of a variety of course delivery systems that they can utilize both in the classroom and in distance education settings.

Background of Study

This study analyzed faculty responses to the questions "What reasons do faculty cite for preferring to deliver courses via distance education and/or in traditional classroom settings?" The sample of this study included division chairs and faculty at five campuses of one community college located in the Southeastern part of the United States whose teaching loads consisted of (1) distance education courses and classroom courses; (2) solely distance courses; (3) solely classroom courses. At the time this survey was conducted in the fall of 2001, the total student headcount consisted of 39,138. The 15 division chairs and 572 full-time faculty were surveyed and 13 division chairs and 167 faculty replied.

The community college where this study was conducted offered courses via distance education using four methods: (1) written correspondence courses through the use of the United States Postal Service; (2) Blackboard via the internet; (3) tele-courses; (4) audio visual courses. Tele-courses are delivered through the seven cable television systems currently available in the state where the community college operates. The audio-visual courses are provided through an asynchronous learning network. Blackboard version 5 is a comprehensive and flexible e-Learning software platform that delivers a course management system, and, with a Level Two or Level Three license, a customizable institution-wide portal and online communities. In addition, a Level Three license includes advanced integration tools and APIs to seamlessly integrate Blackboard 5 with existing institution systems (http://www.blackboard.com/).

Faculty Characteristics

The divisions in which the 116 "classroom faculty", who responded to the survey, taught included a range of seven disciplines from liberal arts to the sciences and social sciences; the 51 multiple delivery faculty, who responded to the survey taught across five disciplines and the "distance-only faculty" who responded reflected three disciplines. The thirteen division chairs who responded to the survey represented six disciplines (see table 1).

Table 1
Divisions in which Faculty and Division Chairs Teach

	Liberal Arts	Math, Science & Engineering	Business & Technology	Social Sciences	Health Technologies	Visual and Performing Arts	Nursing
Classroom Faculty	32%	24%	16.5%	11.2%	8%	6%	2%
Multiple Delivery Faculty	35%	18%	39%	0%	6%	0%	0%
Distance-only faculty	43%	14%	43%				
Division Chairs	15%	31%	23%	15.5%		8%	7%

Years Taught at the Community College

Distance and classroom faculty had taught at the community college for almost the same mean number of years with classroom faculty having taught an average of 16.5 years and distance faculty having taught an average of 17.5 years. Division chairs had taught at the community college for a slightly longer period of time, as their average number of years teaching was 20, while the mean number of years they had been chair was 16.

Faculty Appointment Status

The vast majority of faculty were hired on a contract basis (85% percent of "classroom faculty", 84% of "combination-delivery faculty" and 100% of "distance-only faculty"). Only a small percentage had received tenure (11% of "combination- delivery faculty" and 5% of "classroom faculty."

Faculty Course Loads

"Combination-delivery faculty" who taught both distance and classroom courses appear to have a heavier teaching load than did their colleagues who only taught classroom courses or those who taught only distance courses. However, any faculty member who teaches via distance education at this community college has to contend with "rolling admission" (a policy which allows students to be admitted to their classes at any point during a semester). Division chairs were required to teach one course each academic year which can be taught either in a traditional classroom setting or via distance education. The reader should note a limitation of this study, i.e., course-load was calculated by the number of different courses faculty taught, not by the number of sections (see table 2).

Table 2
Course Loads by Faculty Type

Faculty Group	Average Number of Classroom Courses Taught	Average Number of Distance Courses Taught
Classroom Faculty	4.35	0
Combination-Delivery Faculty	3.5	2.25
Distance-Only Faculty	3	0

Years of Experience in Distance Education

"Combination-delivery faculty" and "Distance-only faculty" had on average the same number of years experience in distance education (see table 3)

Table 3
Years of Faculty Participation in Distance Education

Faculty Group	Median Number of Years Teaching via Distance Education	Over 10 Years of Experience Teaching Via Distance Education	6 to 9 Years of Experience Teaching Via Distance Education	2 to 5 Years of Experience Teaching Via Distance Education
Combination-Delivery Faculty	5 years	28%	17%	33%
Distance-Only Faculty	5 years	44%	28%	28%

Faculty Training in Distance Education

As expected higher percentages of faculty who taught distance courses had received distance training than faculty who only taught classroom courses (see table 4)

Table 4
Percentage of Faculty Who Have Received Distance Education Training and their Interest in Further Training

Faculty Group	Have Received Training	Interested in Further Distance Training
"Classroom Faculty"	16%	7%
"Combination-Delivery Faculty"	56%	31%
"Distance-Only Faculty"	43%	43%

Design and Methodology:

Survey methodology was deemed the most appropriate means of data collection for this study as it is meant to serve as a foundation for future data collection at other community colleges. During the fall of 2001 five hundred and seventy-two faculty and fifteen division chairs at this community college received cover letters that provided an overview of the study and a copy of the survey. Of the one hundred and sixty-seven faculty who responded, one hundred and sixteen faculty taught only classroom courses; seven taught distance courses and forty-four faculty taught classroom and distance courses. Eight of the thirteen division chairs who responded to this survey had taught a distance course.

The survey was based upon Betts' (1998) instrument. The first section of both surveys addressed demographic questions. Additional questions focused upon faculty support, rewards, and the changing role of the faculty member in distance education and how faculty and division chairs perceived distance education as relating to the community college mission. Data analysis included both qualitative (short answer questions), and quantitative (means, standard deviations, frequency distributions and percentages).

Faculty were divided into three categories by the means which they used to deliver their classes: (1) "distance-only faculty" refers to faculty who taught courses via distance education (i.e., via the internet, correspondence, CD Rom or a combination of all three delivery systems); (2) "combination-delivery faculty" refers to those faculty who taught traditional classroom courses and distance courses and (3) "classroom faculty" who taught only traditional face-to-face classroom courses. All classroom faculty, distance faculty and division chairs were asked to respond to the questions "Should community college faculty be rewarded differently for their involvement in distance education? How should faculty be compensated for participating in distance education training? How should faculty be compensated for developing distance courses?"

Results from the question, "Should community college faculty be rewarded differently for their involvement in distance education?" were measured in the means of responses from faculty and division chairs. Means averaging between 1.0 and 2.0 were cited as strongly disagreeing; means averaging between 2.0 and 3.0 were noted as disagreeing; means averaging between 3.0 and 4.0 were neutral; means averaging between 4.0 and 5.0 were noted as agreeing and means greater than 5.0 were noted as strongly agreeing. Responses to the follow-up question of "If yes, why should they be rewarded, and if no why shouldn't they be rewarded?" were coded as qualitative data and are presented in a summary format with actual quotes to illustrate faculty's actual viewpoints.

In order to respond to the question "How should faculty be compensated for participating in distance education training? How should faculty be compensated for developing distance courses?" Faculty were asked to choose one or all of the following responses: release time, stipend, neither stipend or release time. Answers to these questions were analyzed in terms of percentages by faculty group.

Data Analysis

Table 5 displays the results when all survey respondents were asked which delivery systems they were trained to use.

Table 5
Delivery Systems Faculty were Trained to Use

Faculty Type	Black Board	First Class	Tele-course	Internet	Cable TV	V-Ttel CVN	Video	Compressed Video
Distance Faculty	24%	14%	10%	6%	4%	2%	4%	6%
Classroom	4%	3%						1%
Division Chairs	15%		16%	8%		8%		6%

Preferred Delivery Mode – Synchronous or Asynchronous

Distance faculty and division chairs both preferred to deliver courses in an asynchronous mode. Classroom faculty preferred to deliver their courses in a synchronous manner. (See table 6)

Table 6
Distance faculty, Classroom Faculty and Division Chairs' Preferred Mode of Course Delivery

All Distance faculty	Synchronous (16%)	asynchronous (41%)	both synchronous and asynchronous (24%)	Undecided 0%
Distance-only Faculty	14%	42%	28%	0%
Classroom Faculty	synchronous (43%)	asynchronous (10%)	both synchronous and asynchronous (9%)	Undecided 0%
Division Chairs	synchronous (25%)	asynchronous (25%)	both synchronous and asynchronous (25%)	Undecided 25%

Table 7 displays the technologies distance faculty currently use to deliver or support their distance courses:

Table 7
Distance Education Delivery Systems Currently Used by Distance Faculty

Faculty	Cable TV	Two-Way Computer Conferencing	CD Rom	Internet	Videotape	Email	Other
Distance Faculty	20%	20%	20%	84%	47%		< 6%
Division Chairs		8%	8%	23%	8%	31%	

The Relationship between Distance Education and Mission of the Community College

The vast majority of responses to this questions revealed that faculty and division chairs perceive distance education as contributing to the teaching portion of the community college mission. The responses are outlined in Table 8 below in greater detail.

Table 8

Distance Faculty, Classroom Faculty and Division Chairs' Responses to the Question, "How Does Distance Education best fit the Categories of Teaching, Research or Service?"

Faculty Type	Teaching	Research	Service	Teaching, Research & Service	Teaching & Service	Teaching & Research	Not Sure
Distance Faculty	65%	0%	2%	2%	20%	4%	2%
Distance Faculty - only distance courses	57%	0%	0%	29%	0%	0%	0%
Faculty	44%	3%	13%	6%	14%	4%	3%
Division Chairs	62%	0%	0%	0%	31%	8%	0%

Responses to Open-Ended Questions

Many survey questions asked for faculty to elaborate upon their answers. The following responses are answers to open ended questions.

The vast majority of classroom faculty preferred synchronous delivery as they perceived that it would be most identical to a traditional classroom environment. Consequently it would provide them with all the benefits of classroom learning that include immediate feedback from their students, face-to-face interaction with their students (which some claimed as being vital to the learning experience), the ability to immediately detect learning difficulties and that energy that they claimed only classroom teaching could provide.

Comments from classroom faculty who preferred a synchronous environment included: "So I can read my students' expressions." "I want synchronous interaction or I will feel lost in the classroom." "Synchronous environments ….. generate energy close to what the face-to-face environment generates." "Synchronous direct and active interaction is the best learning environment." "Synchronous environments provide the spark that is necessary for teachers and students." "Synchronous learning is more appropriate for didactic and group interaction. One cannot improve human communication as much as possible without face-to-face contact, reading non-verbal behavior and immediate feedback." "I enjoy the face-to-face interaction with students mostly because I am a visual learner, so I rely upon facial expressions to enhance my communication." "I prefer synchronous environments so I have a feel for how the student is doing." "In synchronous environments students can exchange their ideas, argue, fight and finally agree on a solution. You cannot do this from a distance with time delay." "I think I would prefer synchronous. I depend upon immediate feedback from my students to know whether they get what I am saying and tailor a class to the type of response I get. I often get students with a dramatic variety of English skills and experience in health care settings so no one plan works for me." "I would prefer synchronous as I still need a physical class to create a sense of camaraderie."

Some classroom faculty perceived only difficulties that could arise as a result of a non-synchronous environment. “I don’t like the idea of a timed delay as with non-synchronous because I feel the lesson is not flowing well. Most definitely information could be lost or misinterpreted.” “Personally I believe that in general, a lag time from student learning to asking questions to getting responses to a question can be a detriment to the learning curve.”

There were classroom faculty who perceived some value to non-synchronous delivery, mainly that it gave both the student and professor time to reflect upon their work and prepare responses to others’ comments. “I prefer non-synchronous, as I like to think and gather my thoughts in order to plan ahead.” “Non-synchronous adds the benefit of time convenience for both instructions and students. I think work would be more thoughtful or well written.” “I would prefer the non-synchronous environment to facilitate a necessary hesitation to afford the student the best possible answer.”

The vast majority of distance faculty preferred to deliver their courses in a non-synchronous mode mainly because (1) it allows for learning to occur at times that are convenient for faculty and students, (2) the time delay allows students more time to reflect upon their work; (3) it enables students who otherwise couldn’t enroll in college courses to complete them through distance learning. “Easier for students to access the course when it’s convenient for them.” “Students are employed and can respond during non-working hours.” “I think the accuracy of the subject matter and higher quality of students’ work lends credibility to distance education. When you have time to think and prepare a response.” “I support the idea of ‘any time any place learning’. It increases the flexibility of participation. “Attempts to use both synchronous and non-synchronous for the same course have resulted in poor attendance.” “I prefer non-synchronous for the time to prepare and adjust.” Only one faculty member had a negative comment about non-synchronous delivery, “Non-synchronous allows faculty and students more flexibility in time management, but may encourage procrastination and W grades given. Also less time for updating materials, especially if they are video-taped or canned.”

Division chairs were almost evenly divided over their preference for synchronous (25% or three division chairs), non-synchronous (25% or three division chairs), a combination of synchronous and non-synchronous (25% or three division chairs) and 25% of chairs who didn’t have experience in either type of delivery and therefore were undecided as to which one they preferred.

Chairs that preferred synchronous environments cited the following reasons: “Students would benefit from other students’ comments, and questions could be answered that benefited the entire class.” “It’s a more robust learning environment.” “I prefer synchronous, as the on-line format is very time consuming.” “Synchronous would be more efficient, although the technique is more susceptible to technological interference.”

Chairs who replied that they would rather engage in non-synchronous courses provided the following rationale for their response: “I prefer non-synchronous as it is not as demanding on my time.” “I can control when I respond to students’ questions.” “Non-synchronous allows students who are busy to complete the course at their own pace.” “I am more interested in developing a non-synchronous class so that students could access it from any site.”

Impact that the Role of Facilitator had upon Choice of Course Delivery

One survey question provided this definition of a facilitator “One who enables students to interact with course content, learn from classmates and become active participants in their own learning” (Moore and Kearsley, 1996). Respondents were asked to indicate if the paradigm shift from being a teacher who gives expert knowledge to being a facilitator has impacted their decision to deliver their courses via distance education.

Some classroom faculty responded that they could be a more effective facilitator in a traditional classroom environment. “I think the teacher is a facilitator in the classroom (unless they are boring dull lecturers)! I totally disagree with the whole concept of the above definition of a facilitator and I am by far not certain that distance learning makes the one who delivers it a facilitator! The theory assumes quite a lot.”

Three classroom faculty questioned whether the community college was an appropriate environment to conduct classes as a facilitator rather than as a teacher. “You have to have students who are responsible adult learners!” “Students are learning to be more active in their learning process and I see this as a plus *for those who can handle it.”* “Most of the students we teach here are helped by a teacher and not by a facilitator.”

A number of classroom faculty also questioned if distance education provided an environment where facilitation could take place. “In a synchronous classroom I felt less able to facilitate as I could not use the group discussion as well.” “This is what I do. What I’ve always done. It’s also what suffers with distance education.” “I view myself as a facilitator and firmly believe that the classroom offers the best environment for that style.” “A lot depends on the course the instructor is teaching. Some courses are better with facilitators, others with a teacher.”

Over half of the distance faculty who responded to this question replied that the shift from teacher to facilitator did not have any effect upon their decision to participate in distance education. Like their colleagues who teach classroom courses, distance faculty view themselves as facilitators in both delivery systems of classroom and distance courses. “Knowledge needs to be a shared experience.” “In both the classroom and in distance courses there is a constant interplay between these two roles of teacher and facilitator.”

The majority of distance faculty replied that they preferred being facilitators as the students who enrolled in distance courses more frequently became engaged in their own learning. “In a traditional classroom the students don’t have to do research and work out the concepts they don’t understand because the teacher is there ready to answer the questions. In distance learning the students have to spend more time figuring out the concepts on their own and when they do, I believe true learning has occurred.” “Students are better prepared when they own their education.” “It improves learning!”

Summary

The researchers caution that this study is generalizable only to community colleges in a metropolitan setting that offer a broad range of academic programs and have a small percentage of distance faculty.

Distance faculty received more training (56%) than their colleagues who solely taught classroom courses (16%). Most likely the higher degree of training that distance faculty received resulted in them having a higher usage rate of Blackboard (24%) compared to that of their classroom colleagues (4%). All faculty and division chairs cited the internet as the type of technology they most frequently used in their courses.

Classroom and distance faculty differed greatly in their preference toward asynchronous and synchronous course delivery. Forty-two percent of distance faculty preferred asynchronous and 28% preferred a mix of synchronous and asynchronous delivery. Forty-three percent of classroom faculty preferred synchronous delivery of courses, as the majority cited that this type of delivery was most comparable to a traditional classroom environment. Only 10% favored asynchronous delivery and 9% favored a combination of synchronous and asynchronous. Division chairs were

equally divided amongst their preference of the three types of delivery (synchronous, asynchronous and the use of both).

Reasons classroom faculty cited for preferring synchronous delivery of courses included its close similarity to a traditional classroom setting; the flexibility it gave them in changing their course structure to respond to students' learning needs; the opportunities it provided for them to physically observe any difficulties students experienced and the ability for them to immediately respond. Classroom faculty cited distance learning as presenting challenges to the learning environment and consequently influenced their decision to teach only in a classroom environment. These challenges included: distance learning was not conducive to their discipline (i.e., English as a second language; speech communications); delay in delivery interrupted the continuous flow of discussion that could occur in a classroom; the inability to see students' faces in an on-line course interfered with faculty's ability to perceive any difficulty students may be encountering. A number of classroom faculty expressed a concern that traditional aged community college students were not developmentally ready to engage in a facilitated distance learning environment as they lacked the self discipline, time management and independent learning skills necessary for success in distance learning courses.

The only benefit to distance learning which was noted by a minority of classroom faculty was that the time delay in course delivery could provide students with greater opportunity to reflect upon the text and class discussions.

Distance faculty preferred asynchronous delivery of courses for three reasons: a) distance courses provided greater access to learning to a larger population; b) the time delay between presentation and discussion of material provided students with greater opportunities for reflection and thus encouraged more independent learning; 3) distance learning provided opportunities for students to enroll in college courses who otherwise would be unable to attend college. Distance faculty preferred to be teachers in a distance education environment as students in these types of courses are more active and responsible learners.

> *Sixty-five percent of distance faculty, forty-four percent of classroom faculty and sixty-two percent of division chairs agreed that distance education best compliments the portion of the community college's mission that relates to teaching. Twenty percent of distance faculty, fourteen percent of classroom faculty and thirty-one percent of the division chairs placed distance education as contributing toward the service and teaching parts of the community college mission.*

Conclusion

"With the advent of distance learning, community colleges now serve a global community" (Crosby and Schnitzer, 2003). Thus, they must formulate a strategic plan that will enable them to serve students in their local geographic area and their larger audience who enroll from across the country or the world. A community college's strategic plan should assess their resource allocation; their long and short range goals for distance learning programs and identify their primary motivating factor for engaging in distance education. These motivations (potential for increasing enrollment and thereby increasing revenue; reducing costs of maintaining physical facilities; need to remain competitive with area colleges, etc.) will drive the level of institutional commitment toward distance learning, and in turn will have a direct impact on the extent to which resources are allocated to distance education programs versus campus based enrollments (Beaudoin, 2003; Distance Education Handbook, 1999; Howell et. al , 2003). Most importantly, if a distance education program is to succeed, it should directly relate to the mission of the college (Distance Education Handbook, 1999).

Once a strategic plan has been formulated, and the number of faculty needed to teach distance courses has been identified, deans can then begin to examine ways in which departments can best attract and encourage faculty to teach via distance education. Providing opportunities for classroom faculty to learn first hand about the experience of teaching via distance from distance faculty is the best way for them to decide if this is a type of teaching they would like to explore. Exchanges between distance and classroom faculty are also a means for them to build collegial relationships and perhaps become mentors to each other in regards to teaching methodologies. (Abromotis, 2001). Community colleges should not rely upon collegial relationships as a motivator for faculty to engage in distance education. They also examine their faculty position descriptions and integrate distance education and use of technology into the college's criteria for tenure and promotion (Howell et. al, 2003; North Carolina State University Compact Plan for 2003-2005). Faculty's engagement in training and their integration of technology into their courses should constitute part of their performance evaluation (Abromotis, 2001).

In addition to technology training, faculty may also need financial support and moral support from department chairs as they expand their distance education teaching load. Pachnowski; Jurczyk, (2003) found that as faculty continued to develop and teach distance courses their need for prep-time and training decreased, but while their need for financial and collegial support remained constant, it decreased over time. In light of these findings Pachnowski; Jurczyk (2003); Parker (2003) stressed that financial support in the form of a stipend; reduced teaching load; training were particularly important to faculty in their first semester of distance teaching, if they were to continue teaching via distance.

While providing financial compensation; technology training and support and collegial support from colleagues to faculty on an individual basis may persuade faculty to teach via distance, colleges also have to develop a long term plan of how they will attract new distance faculty and nurture continuous development of current distance faculty. One means of integrating technology training and instructional design would be through the creation of an instructional design center where faculty can develop or enhance their classroom and distance teaching methodologies. (North Carolina State University Compact Plan for 2003-2005). Centers such as these may provide the environment conducive to collegial mentoring.

In a time of winnowing resources colleges should also seek to form partnerships with other institutions so that resources can be pooled and costs can be reduced. North Carolina Community College (NCCC) has created such a partnership with East Carolina University (ECU) and North Carolina A & T State University (NCSU). NCCC targeted a need for instructional development, particularly in the areas that will enable faculty to integrate technology into their courses and developing new ways of reaching adult non-traditional students. NCCC also anticipated a high rate of retirement and has instituted a new requirement that division deans must have earned a doctorate. Given these conditions, NCCC has partnered with ECU and NCSU in forming a Leadership Development Academy. This academy will be charged with (a) creating an instructional design support system for faculty; (b) funding a new faculty position targeted to the delivery courses and student services with the use of technology and distance learning; (c) evaluating the community college curriculum; (d) identifying cooperative relationships that could be created amongst NCCC, ECU and NCSU (North Carolina State University Compact Plan for 2003-2005).

Colleges should seek to provide faculty with the support on several levels if they need to engage in distance learning. This support would be reflective through a strong institutional mission and strategic plan; proper allocation of resources; linking the integration of technology and teaching methodologies; listening to faculty's feedback on their distance education experience.

References

Accrediting Commission for Community and Junior Colleges (1999). Distance Education Handbook (ERIC Document Reproduction Service No. ED 440 675). Santa Rosa, CA.

Brookfield, S. (1986). Understanding and facilitating adult learning. San Francisco: Jossey-Bass.

Carr, S. (2001, April 6th). A Columbia University professor praises the interactivity of teaching on-line. The Chronicle of Higher Education.

Crosby, L.; Schnitzer, M. (2003). Recruitment and Development of Online Adjunct Instructors. On-Line Journal of Distance Education Administration. (on-line) IV, 3. http://www.westga.edu/~distance/jmain11.html.

Dillon, C. (1989). Faculty rewards and instructional telecommunications: a view from the telecourse faculty. The American Journal of Distance Education , 3,2,35-43.

Dillon, C. and Walsh, S. (1992). Faculty, a neglected resource in distance education. The American Journal of Distance Education , 6,3, 5-21.

Ehrmann, S. (1999). Technology's grand challenges. Academe, September/October, 42-46.

Gilcher, K. & Johnstone, (1989). A critical review of the use of audio-graphic conferencing systems by selected educational institutions. College Park: International Universities Consortium, University of Maryland.

Gillespie, K. (Ed.)(1998). The impact of technology on faculty development, life and work: Vol. 76, Winter, New directions of teaching and learning. San Francisco: Jossey Bass.1-5.

Grossman, D. (1989). Distance education: consolidating gains. In Proceedings from the Fifth Annual Conference on Teaching at a Distance. Madison, WI, p. 28-39.

Gunawardena, C. (1990). Integrating telecommunications systems to reach distance learners. The American Journal of Distance Education , 4,3,38-46.

Hassenplug, C. & Harnish, D. (1998). The nature and importance of interaction in distance education credit classes at a technical institute. Community College Journal of Research and Practice, 22, 591-605.

Howell, S.; Williams, P.; Lindsay, N. (2003). Thirty-Two Trends Affecting Distance Education: An Informed Foundation for Strategic Planning. On-Line Journal of Distance Education Administration. (on-line) VI, 3. http://www.westga.edu/~distance/jmain11.html.

Kirby, D. and Garrison, D. (1989). Graduate distance education: a study of the aims and delivery systems. In proceedings from the Eight Annual Conference of the Canadian Association for the Study of Adult Continuing Education. , 179-84. Cornwall, Ontario: St. Lawrence College of St. Laurent.

Knowles, M. (1984). Andragogy in action: applying modern principles of adult learning. San Francisco: Jossey Bass.

McNeil, D. (1990). Wiring the ivory tower: a round table on technology in higher education. Washington, D.C.: Academy for Education Development.

Moore, M. & Kearsley, G. (1996). Distance education: a systems view. 4-8, 11-12. Belmont, California: Wadsworth Publishing Company.

North Carolina State University, Deparment of Adult and Community College Education. (2003). Revised Compact Plan for 2003-2005. (ERIC Document Reproduction Service No. ED 440 675). Raleigh, NC.

Pachnowski, L.; Jurczyk, J. (2003). Perceptions of Faculty on the Effect of Distance Learning Technology on Faculty Preparation Time. On-Line Journal of Distance Education Administration. (on-line) VI, 3. http://www.westga.edu/~distance/jmain11.html.

Parker, A. (2003). Motivation and Incentives for Distance Education. On-Line Journal of Distance Education Administration. (On-line) IV, 3. http://www.westga.edu/~distance/jmain11.html.

Plater, W. (1995). Future work: faculty time in the 21st century. Change, May/June, 23-33).

Scriven, B. (1986). Staff attitudes to external studies. Media in Education and Development. 19, 4, 176-183.

Stinehart, K. (1988). Increasing faculty involvement in distance teaching. In Developing distance education, eds. Stewart, D., (1987). Daniel, J. and Strain, J. (1987). The role of the faculty member in distance education. The American Journal of Distance Education, 1,2,61-65.

Wolcott, L. (1993). Faculty planning for distance teaching. The American Journal of Distance Education, 7, 1, 26-36.

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Editor's Note: Alaa Sadik from Quena in Egypt discusses design elements for online distance learning. Using the literature on research, theory, and practice he provides a plan that encompasses technology, curriculum, implementation, and management.

The Design Elements of Web-Based Learning Environments

Alaa Sadik

Abstract

Constructing on-line learning environments requires designing and developing various elements. These elements should be available to deliver instruction, enhance the quality of learning, facilitate interactions and support the learner. Examples of these elements are tutorials and assessment components, instructional support utilities, interaction tools, management and monitoring tools and help and support topics. In this article, the tutorial component, for example, consists of modules and lessons. Each lesson is arranged in a hierarchy of new concepts self-assessment, exercises, links to related Web sites and discussion areas. Management and administration tools are designed to help the on-line tutor to control/understand how the on-line class operates and to track students' progress. In addition, they help students to register with the on-line class, access course grades and edit work. The interaction component is designed to facilitate student-tutor, student-student and student-content interaction.

Introduction

In the last few years, the Internet and World Wide Web have given new impetus to educators and computer-aided instruction designers who attempt to design and develop interactive, intelligent and human-based courseware to move toward the Internet. Wise (1996) pointed out that the Internet has begun to have a significant role in education and change the nature of teaching and learning, since it provides learners with a wide range of learning opportunities and experiences.

Hites and Ewing (1997) described the Web as a powerful tool that facilitates the distribution of instructional resources regionally and globally. They drew attention to the development in Internet use in distance education by instructors who have begun to use e-mail and discussion groups to enhance and expand instruction and promote interaction. The Web has many of the features of audio-visual media (e.g., text, image, sound and video clips) as well as the ability to support interaction between the learner and others. Asynchronous communication technology is one of the unique features of the Internet.

In a comparison study between the traditional library and the Internet as a global library, Ryder (1996) pointed out that although the Web is likely to yield more up-to-date information and be more accessible than traditional libraries, the traditional library is likely to yield higher quality and more accurate results than the Web. The main difference between the Internet and the traditional library is that not all the items available on the Web are identified or can be retrieved easily by a single search engine.

Although the interactive, global, hypermedial and flexible nature of the Web offers many ways to enrich the learning experience, motivate learners and meet the diversity in backgrounds, 'many on-line courses lack basic design consideration and that the web is simply being used as a

medium for the delivery of instruction created within another framework' (Chellman and Duchastel, 2000, p. 229). Chellman and Duchastel indicated that it is not appropriate simply to upload traditional textbooks to the Web to create an on-line learning environment.

Powell (2001) also argued that although establishing on-line learning environments and delivering courses via the Web is growing rapidly, many Web developers and on-line tutors struggle with 'how to successfully use the available tools and technologies to organize instructional content into well crafted teaching systems that support learning' (p. 44). Powell pointed out that many instructional, structural, technical, navigational and content-related factors should be considered in designing and evaluating on-line learning to maintain and secure students' interest, motivation, satisfaction and success.

The design elements of Web-based learning environments

To design effective Web pages and content, Harbeck and Sherman (1999) argued that since students may be unable to navigate through a learning environment, deal with sophisticated software and hardware, make appropriate choices, participate in activities or control the programme, instructional designers and tutors should take close look at the design of the user-interface, guiding approaches, methods of encouraging interaction among learners and involving students in beneficial activities and individualised learning.

Ritchie and Hoffman argued that the Web as a hypermedia environment uses graphics, colours, animated images, visual effects, sound and movies, which have long been used as external stimuli to motivate learners. In addition, using the hypermedia capabilities of the Web, developers can offer different levels of instruction for learners who have diverse backgrounds or knowledge, to remind learners of their existing knowledge. Therefore, the learner can select among different links, take decisions and co-operate with other learners. Moreover, using synchronous and asynchronous methods, the on-line tutor can provide students with guidance and feedback during learning. Lastly, the recent interactive Web-based objects (e.g., CGI, Java, and ActiveX) could be exploited to construct online testing and engage students in online exams as self-tests to help the learners to evaluate themselves. In addition, CGI scripts can be used to provide learners with a remedy if they have problems, or to extend their knowledge.

However, stating another point of view, Oliver (1999) believes that although many studies have suggested design guidelines for designing on-line environments 'the advice is very broad and covers all aspects of instructional design. […] The plethora of advice being offered is often difficult to digest and apply' (p. 241). Based on the notion of constructivism, Oliver described a framework to identify and distinguish between three main elements in the design of on-line learning environments. These elements that influence learning outcomes are course content, learning activities and learner support (Figure 1).

Oliver believes that, first, the learning environment should provide learners with the content and resources in a variety of ways and 'as a means to an end rather than an end in itself' with the freedom of the learner to choose his/her own path through the content. Second, the learning environment should provide the learner with such activities and opportunities for 'reflection and articulation'. Third, learner support is necessary to guide learners, provide assistance during learning and provide feedback.

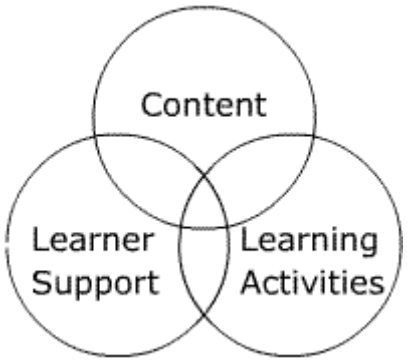

Figure 1. Design elements of on-line learning environments (Oliver, 1999, p. 243)

However, while Oliver (1999) restricted on-line support to a narrower context, known as scaffolding, Simpson (2000) provided a more extensive and wider definition of on-line support. According to Simpson, student support indicates 'all activities beyond the production and delivery of course materials that assist in the progress of students in their studies' (p. 6), including academic support (e.g., exploring the course, providing feedback, chasing progress) and non-academic support (e.g., advising, assessment, administration, etc.). Simpson concluded that the Internet could enhance student support in two ways: 'supplying information of various kinds; and offering interactive and diagnostic programmes' using e-mail, synchronous and asynchronous conferences and information resources (p.80).

Moreover, Chellman and Duchastel (2000) argued that the design of on-line learning environments should consider 'the full spectrum of design, including both content and technology elements' (p. 229). Content elements are the basic instructional design elements (e.g., content, objectives and evaluation). Technology elements are the medium-related features that support learning (e.g., interaction mechanisms, management elements and interactive Web-based elements) (Chellman and Duchastel, 2000).

Elements of on-line learning environments

The review of the instructional design literature showed that various features and instructional and support elements should be available in on-line learning environments. These elements characterise Web-based education in particular and exploit the Web's capabilities to establish 'virtual' learning environments for distance students. The most common elements found in the writings of Carr-Chellman and Duchastel (2000), Chellman and Duchastel (2000), Fisher (2000), Harrison and Bergen (2000), Weston and Barker (2001) and Chou (2003) are addressed and described below. However, pointing out these elements does not mean that all of them must be available in any Web-based learning environment. Developers and instructors could choose the appropriate components they need or modify them according to the course objectives, learners' needs, costs and any other factors.

First, online modules use carefully designed and multiple forms of media such as hypertext, links, graphics, animation, real-time audio and video and other hypermedia objects (such as Java applets and Macromedia Flash presentations) to improve presentation and involve students in active learning activities (Weston and Barker, 2001). This mix of media should be adjusted to encourage students away from attending traditional classes and towards practicing, discussion and articulating, thus 'optimising the opportunities for self-directed learning and metacognitive learning' (Macdonald and Twining, 2002, p. 604).

The basic purpose of on-line modules is to provide the student with a complete and up-to-date picture of the subject matter, including main concepts, links to Web resources, examples,

exercises and reminders (Harrison and Bergen, 2000). Links to Web sites with authentic contexts or sites that afford access to primary source documents and immediate automated assessment and feedback are examples of useful active elements that should be included in on-line modules (Weston and Barker, 2001).

A course schedule is needed to arrange the learner's time during studying and to keep students together as they work through the course material, but without striking the flexibility of the distance education programme. In addition, a study guide, or course outline, is the student's reference to the course content, tasks and activities associated with the on-line content. Usually, the study guide contains 'any prerequisites for the class, the objectives, a brief listing of topics to be covered, the required materials such as text, specific grading criteria for the course, participation requirements for the course and bibliography' (Harrison and Bergen, 2000, p. 59).

Moreover, Web courses should offer an on-line assessment facility using different types of testing, including assignments and quizzes. Students can use these forms for self-assessment at the end of each module or at the end of the course for final evaluation. Students' responses may be marked automatically and synchronously using CGI or JavaScript programs or sent to the instructor to be marked (Khan, 1997; Goldberg, 1997). 'The provision of automatic assessment can offer enhanced possibilities both for self-study and for class administration' (Marshall, 1999, p. 40). Questions and assignments can be submitted via e-mail or discussion boards or off-line for more comprehensive evaluation and to avoid on-line cheating (Weston and Barker, 2001).

Furthermore, an online library may contain a series of well-categorised and searched links to relevant Web resources is needed. Web designers need to exploit this new type of on-line resource in the course and avoid adding it as an additional part or second reference for students, alongside the course materials. The on-line library may contain Web search engines to search for course-related information, which are not available in the course library. However, it is important for the instructor to test search engines and directories, select those that are suitable for students' knowledge and provide them with help.

Second, although the Web offers many asynchronous and synchronous interaction tools (e.g., e-mail, discussion boards, listservs, chat room and conferences), a few researchers have offered guidelines for designing technically on-line interactive functions (Chou, 2003). Adding discussion forums and chat rooms, for example, to on-line courses may be a useful way to facilitate student-tutor and peer interaction, encourage co-operative learning, enable the on-line tutor to observe and assess students' contributions and scaffold their thinking (Angeli, Valanides and Bonk, 2003). In addition, interaction elements can be 'a valuable teaching tool in countering the isolation felt by distance education students' (Dymock and Hobson, 1998, p. 157). Using an announcement board, the instructor can post news or announcements to keep all learners up to date and involved (Huang, 2000). Students can access this board regularly to read the instructor's announcements. In addition, students can post their own announcements to the class.

In addition, students' and tutors' profiles could be presented through personal Web pages to foster the sense of community and that the class is not just a group of isolated learners. Personal Web pages that include student's e-mail address, photo, home town and other information encourage students to learn about each other and encourage individual interaction (McConnel and Sharples, 1983).

Third, class management elements are necessary to ensure that the on-line class operates efficiently, including registration tools, assessment and distribution of grades and student tracking (McConnel and Sharples, 1983). A registration tool, for example, is needed to ease class enrolment and management. Students use this tool to provide personal information and join or withdraw from the class. In addition, server logs can be used to track students' participation and progress, assignment submissions, completion of quizzes and participation in discussions.

The above review shows that the features and elements of on-line learning environments could be categorised into four main components:

1. a tutorial component (on-line modules, study guide and tests, etc.);
2. an interaction component (interaction tools such as e-mail, discussion boards, etc.);
3. a management component (class management, course schedule, announcement board, etc.); and
4. a support component (on-line library, personal pages and tracking, etc.)(Figure 2).

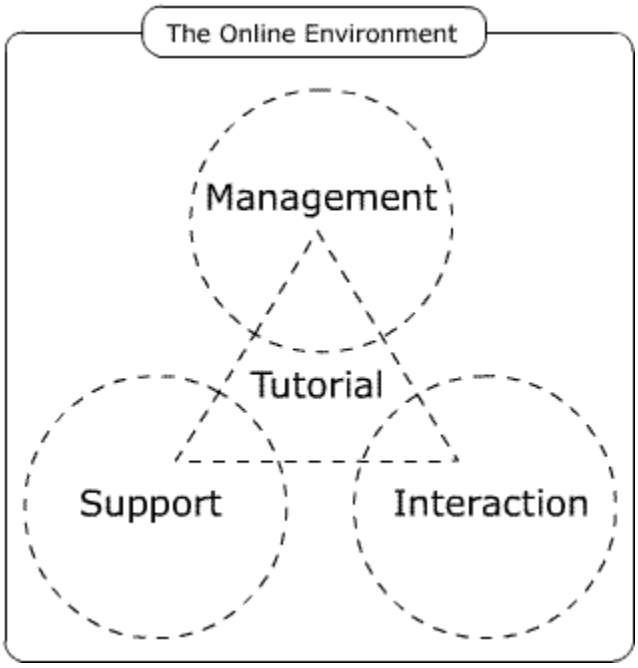

Figure 2. Elements of Web-based learning environments

The above figure shows that while the tutorial component seems to be the central and leading component in the learning environment, it is supported by other components and shares many of its features with the learning environment. In addition, many elements could belong to more than one component at the same time. For example, although e-mail and discussion boards are considered as interaction mechanisms, they are useful tutorial methods. Using e-mail, the learner can interact with peers in the class and with the tutor, ask questions, submit assignments and receive feedback. In addition, using discussion boards, students can post messages to the class, read classmates' posts, respond to teacher's questions or receive feedback about their posts. Similarly, on-line quizzes could be considered as a tutorial element, to assist in knowledge construction, or as an assessment tool to evaluate learning at the end of each module. The dashed lines indicate that the tools and elements of the components of the environment are not bounded within a single component but could be used flexibly in many ways within the learning environment.

The design of a Web-based learning environment for distance education

To show how these elements look in practice, the design and development of an on-line class, called Wired Class, is described as an example of developing these elements (Figure 3). These components are categorised into five groups rather than separate links. Each group is called a 'room' and each room contains components, which serve the same objective or are similar in

features (such as interaction tools). For example, e-mail, chat rooms and discussion boards are categorised into one room called 'Communication Centre'.

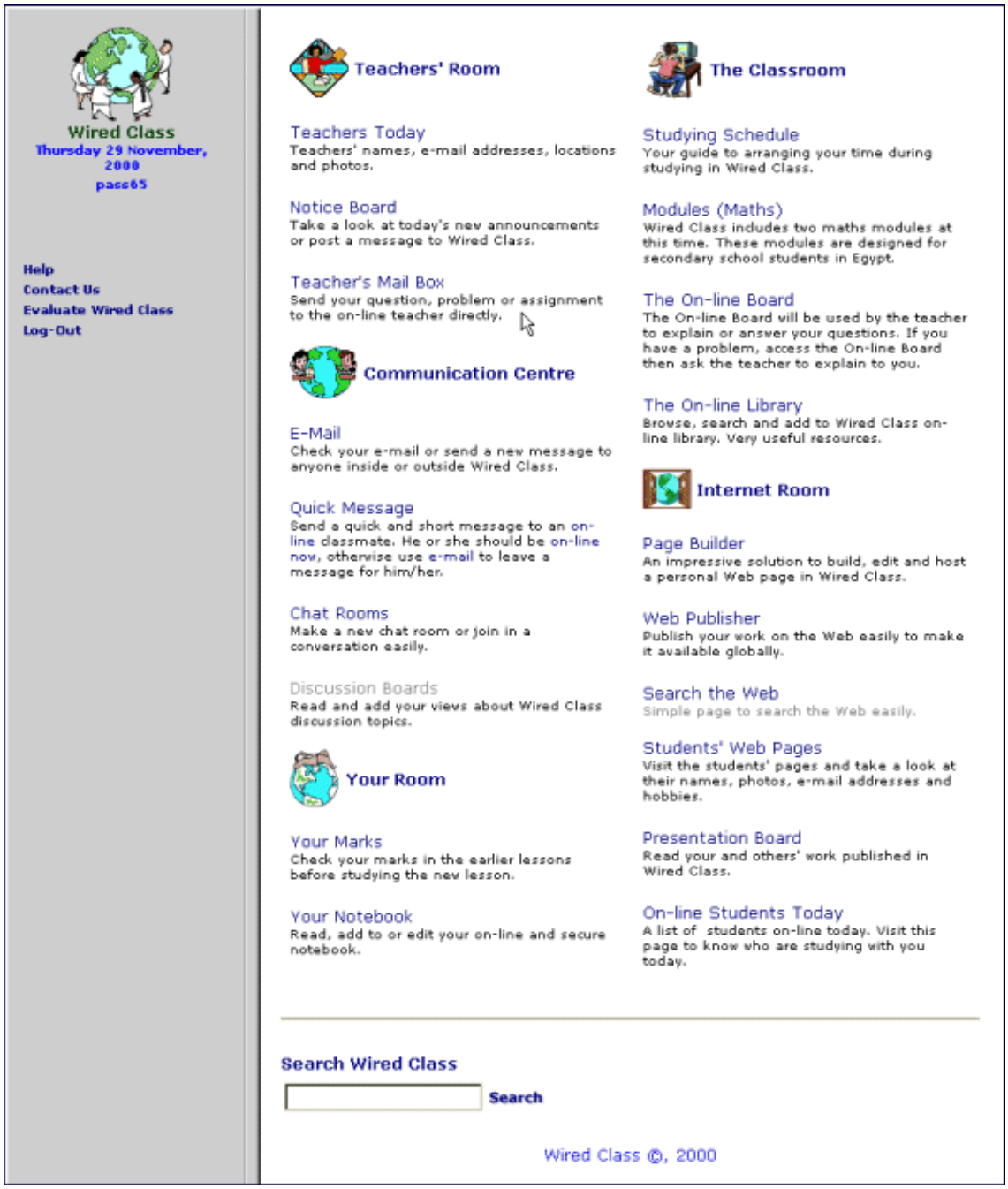

Figure 3. Components of Wired Class

1. Tutorials and assessment

Tutorials, also known as content delivery, refer to the course materials that are to be delivered to the students. The course content may be in the form of text, graphs, multimedia presentations or interactive Java simulations. Tutorials (modules and lessons) are the pivotal component in the

learning environment and all other components and elements are designed to serve the subject as represented in the modules. Since the subject content, as represented in the student textbook, is not suitable to be delivered directly via the Web, converting the textbook materials to Web pages would make them nothing more than electronic pages for reading via the computer screen.

The need to conduct interactive learning required the traditional content to be re-edited and interaction objects to be added (e.g., interactive graphs, hyperlinks, quizzes, etc.). To achieve this purpose, first, the subject content was logically divided into two modules, each module containing six lessons followed by a revision and exam lesson. Second, each lesson was segmented into seven chunks using the principles and objectives of the teaching approaches. These parts were entitled the lesson, further examples, self-test, exercises, links, discussion and send to the teacher.

Basic elements of the course content (e.g., facts, concepts, skills, examples, etc.) were presented under the 'lesson' section. However, they were re-written in the light of constructivist principles. Meanwhile, essential concepts and problems were left to be represented in other parts of the lesson (e.g., discussion). Formatted text (using colours, different fonts and styles, etc.), still images and animated graphs were used to represent the lesson content. At the same time, each lesson was segmented logically into many small chunks, each representing one concept, skill or problem.

However, although the lesson section contains one example or more to illustrate a new concept or problem, additional and different levels of examples were provided separately under the 'further examples' chunk, allowing the learner to find more examples and illustrations, if needed.

Self-test is an interactive component in each lesson provided to stimulate learners' thought and action, encourage them to ask questions, motivate them to learn and help them to know whether they understand the main concepts and ideas in the lesson or not. In this task, the learner answers two questions or more using 'multiple-choice', 'matches', 'true-false' and 'filling the blanks' formats. Self-assessment questions allow learners to access areas of the course (within the course or externally on the Web) that have been restricted, or revise specific parts of the lesson again; they are asked to contact the teacher if they repeat a mistake.

Self-test tasks are provided using HTML forms and CGI scripts which run in the Web server. These scripts catch the learner's answer, check it, generate a HTML page including the appropriate feedback then forward it to the learner's browser to let him/her know the right answer at the same time. Using Java Scripts in this case was not appropriate because it requires the answer to be included in the HTML code which can be viewed by the learner if he/she is experienced enough. Even using 'encoded' or 'encrypted' code, it is not possible to generate appropriate feedback pages.

Exercises are similar to traditional textbook exercises, which are very common task in maths education. In Wired Class, the student needs to print out the exercises page and use paper and pencil to answer exercises (e.g., solving equation, graphing a function, etc.). The objective of exercises is to give the learner the chance to practise more mathematics traditionally (using paper and pencil). The teacher's role then is to ask learners about their answers and progress in this task by requesting results using e-mail. These exercises allow more interaction between the learner and the content and between the learner and the teacher.

Unlike CAI courseware, which is restricted by the courseware database, 'links' work as a portal to Web resources. In this part, many useful and well-selected Web sites are suggested for learners. These links vary between tutorial Web sites, illustrating the main concepts and facts included in the lesson using other methods, to problem-based solving sites that encourage learners to construct their knowledge using different and high-level techniques of thinking. To select the

topic and type of a link, the objectives of each lesson and the needs of other tasks (e.g., exercises and discussion) were considered. For example, visiting these links is necessary for solving problems in the 'send to the teacher' task. Many questions were considered when selecting any site to be linked to Wired Class:

- What is the goal of the site?
- Is the material designed for students similar to those of Wired Class?
- Is the information useful and appropriate for the course objectives?
- Is the author of the site qualified?
- Does the site provide links to more detailed information or other sites?

For example, if the site provides links to other external sites, these external sites should be reviewed first. In addition, Wired Class students' attention should be drawn to whether they can continue visiting these external links or not. In addition, since many Web pages are deleted or moved quite often and new Web sited uploaded every day, links can get out of date, therefore links should be reviewed and maintained regularly.

Peer discussion, also, is one of the essential elements in collaborative and constructivist learning. According to constructivist epistemology, peer discussion offers the chance for students to interact asynchronously, negotiate meaning and reflect on their learning and viewpoints through collaborative problem solving. In this part, students are encouraged to construct a part of their knowledge via interaction with each other. A problem is suggested, either by the tutor or students, and learners are required to participate by filling-in and submitting a simple HTML/CGI-based form. Then, the learner's participation is added to the discussion board of each lesson. Therefore, the learner can read others' participation in the board, compare among different points of view, ask a participant for more explanation or comment on others' responses. Access to discussion boards could be done via each lesson or from the starting page. The teacher's role is to monitor the discussion board, motivate students to participate more positively, evaluate learners' participation and send his/her comments to learners, publicly or individually, if needed.

Lastly, the 'send to the teacher' section is the last part in the lesson hierarchy. In this part, the student needs to answer and submit various types of questions using HTML forms. Types of questions are not limited to multiple-choice or filling in blanks. Students can answer essay type, compilation or open-ended questions, which require manual grading by the tutor.

Therefore, this task minimises the problem of 'textual entries' that faces CAI programs, whereby textual entries by the learner can be misspelled and the program has to be written in a way that can deal with many probabilities. Using HTML forms and CGI scripts, learners' responses are collected in a database in the Web server to be assessed and analysed by the human teacher who then sends results and feedback to the learner. This task, in particular, is an extremely important part of each lesson since mathematics requires a human teacher, not an auto-marking program to analyse students' responses and send the appropriate feedback. In addition it could be used to:

- evaluate students' achievement to know whether the learner understand the lesson or not;
- help the tutor to keep students notified of their progress and mastery of the lesson content.
- encourage students to ask the tutor and motivate them to learn.

2. Support utilities

Instructional support utilities include course schedule, on-line library, student's page builder, Web publisher, Web search tool and on-line notebook

Course schedule

The purpose of the on-line schedule is to guide students through the course and help them to manage their time and group-based activities, without destroying the flexibility of distance education. The importance of the schedule is it keeps students studying together, as far as possible, to offer the chance of interaction and co-operation among them. Therefore, a timed study plan is added to guide learners week by week and lesson by lesson (Table 5-4).

The on-line schedule was developed based on the assumption that traditional class students are able to study the course modules in seven to eight weeks (two times a week). At the end of each module, a revision and test were provided to allow learners to recall, summarise and practise the main concepts and skills included in the module. In addition, the course schedule provides week by week tasks that should be achieved. These tasks (such as discussions and group presentation) are not pre-defined; instead, they are left to the teacher and students to suggest.

The on-line library

The purpose of the on-line library is to employ one of unique features of the Web as a global and easy accessible source of information. The on-line library introduces learners to the Web as a supplemental source of course-related information in different formats. This information could be on-line tutorials, provided by other courses and tutors, quizzes, discussion topics, subject-oriented forums and instructional aids (e.g., graphical calculators) to support students in their learning.

The on-line library catalogue is designed to be searchable using a Java Script-based search engine. Search results are yielded as links and short descriptions of relevant Web resources. In addition, public search engines are made available to search the Web, if the library fails to meet the student's needs. Students are encouraged to add Web resources to the library catalogue using the 'add to the library catalogue' facility

Page Builder

Just as traditional classroom students see and contact with each other, on-line students need to see and know each other. Therefore, students' personal Web pages could be used to foster the sense of community and minimise the sense that students are isolated from each other. Usually, personal Web pages present the student's profile (e.g., interests, country, education level, personal photograph, e-mail address and links to favoured Web sites). This information is essential to encourage interaction among students.

However, although there are students who may able to build their own personal Web pages using WYSIWYG HTML editors, designing, building and uploading Web pages for the majority of learners is not an easy task. Therefore, the need was recognised to design a Web-based tool to help students to build their own Web pages. This tool is called 'Page Builder'. Page Builder is a pre-defined 'template' script. This script allows the student to enter his/her personal information (e.g., name, e-mail address, interests, etc.) and personal image then upload it to Wired Class server using a simple HTML form. The script uses this information to generate an HTML page, specifies an HTTP address and links the page to the students' Web page.

One of the most important features of Page Builder is that it uploads the learner's image easily from his/her local disk to the Web server. Therefore, the learner does not need any additional programs, except the Web browser, to build a good-looking page. In addition, the learner could modify his/her page later using his/her username and password. This feature encourages learners to update their pages regularly and allows them to correct any mistake they discover in the future.

Web publisher and presentation board

As the on-line learner's role is changed from recipient to participant, strategies and tools are needed to add an additional interaction dimension to Wired Class. One of these interactive strategies is asking learners to provide course-related presentations. In the traditional classroom, learners can use different types of media to present their work to the class (e.g., whiteboard, graphs, maps, etc.). A similar tool can be provided in Wired Class called the Web Publisher. Using HTML forms, the learner can submit his/her work to be added to the presentation board where students publish their work. In the presentation board, students' presentations are listed, ordered and linked to the presenter's name. In addition, the presenter is able to re-edit his work using his/her username and password.

Web search

To search the Web, relevant search engines were selected to be used by the learners in Wired Class. However, to avoid having access each search engine's Web site separately to seek for course information, these search engines are gathered in a simple HTML form using Java Script. All the learner needs to do is to type a search keyword, or keywords, and select an appropriate search engine, from an opposite drop-down menu, to show the search results in an internal frame within Wired Class.

Learning aids

The purpose of learning aids is to provide students with interactive and support tools that can be used in mathematics learning. Examples of these tools are calculators (numerical and graphical) and equation solvers. Using only Java enabled browser, graphical calculators can help students to examine and visualise graphs of functions, define their domains, investigate relationships, compare functions and zoom in and out. Many mathematical tools were designed, adopted or employed to help students in their learning, particularly with the lack of face-to-face tutor support.

On-line notebook

Students' notebook is an on-line notebook that allows the learner to save any course related information (e.g., comments, exercises, teacher's feedback, etc.) in a personal and secure file in the Wired Class server, using his username and password. Developing a 'notebook' is a relatively difficult task and not found in many learning environments. However, using CGI scripts it is possible to allow the students to transfer and keep their information in the Web server and retrieve it again using their Web browsers only. Functions such as 'copy', 'cut' and 'paste' are used to facilitate information editing. The most important advantage of 'notebook' is that learners do not need paper and pencil or additional software to manage their tasks.

On-line help

Help topics are an essential feature in courseware development and student support. Therefore, a simple and easy access help system was designed to provide students with the information they need to use the various features and elements of Wired Class, including the function of each element and information about the Internet, the Web, search engines, etc.

Help pages are accessed from the 'help' icon or from within any component in Wired Class. In designing help topics and index, the standard MS Windows help style was considered as an easy to use and familiar style of design. In addition, learners are able to get any information they need by clicking on the help node to show a pop-up sub-window. Moreover, a short preview and graphical presentation were provided allowing the learner to learn how to use Wired Class and its components.

3. Interaction tools

Interaction tools varied between asynchronous (e-mail and discussion boards) tools and synchronous (chat) tools.

E-mail

E-mail is one of the most popular and widely used asynchronous interaction tools in the Internet and the Web. The potential of e-mail is that it is a very fast text-based mechanism for conducting interaction between the tutor and students. Web-based e-mail in particular has shaped a new revolution in popularising e-mail using an easy access, simple user interface. For these reasons, a Web-based e-mail service was selected to serve in Wired Class.

There were two possible ways of offering an e-mail service via Wired Class. The first was to install e-mail server software in Wired Class server to work as an independent Web-based e-mail service, taking domain name of Wired Class Web server. Although this option allows a full control over the e-mail service, it is very costly and only suitable for big organisations. The second option was to subscribe to a free e-mail service on the Web. Currently, the number of free e-mail service providers is estimated at more than hundred. These services varied in their capabilities and suitability for Wired Class students.

Although there are numerous chatting systems available which vary in their capabilities (using text, audio and video), most of them are not suitable, either technically or educationally, to the students' level or to be hosted in Wired Class Web server. However, suitable chatting systems were found to be too expensive to be used in small-scale educational applications or at schools. For these reasons, it was necessary to design and develop a simple, and efficient, chat system for Wired Class students. A text-based chat system was found to be the most popular type for easy and fast interaction via the Web. This kind does not require a high specification machine or any additional software in the user's machine except the Web browser.

Technically, conducting a chat room requires running a script in the Web server to be used by two users, or more, at the same time. The main functions of this script are receiving one participant's inputs, using HTML form, then forwarding them to the other participant browser who are running the same chat script. The chat system was designed as two windows in the student's Web browser. The upper window allows the student to input his/her information and a short message. At the same time, the lower one shows students' names and their participation (Figure 5-10).

The essential idea behind this simple design is that a CGI script handles each participant's inputs from the upper form, saves them in a temporary text file, then forwards them (after 5 seconds for example) to the other participant's lower window. The last task is achieved by involving the HTML command 'refresh' in the HTML code in the lower window. The complete CGI scripts in conjunction with HTML forms were designed and developed with students' needs and level in mind. Additional features were added to the chat system make it easy to use and interesting. For example, the learner can establish any number of new rooms and invite others for conversation. Alternatively, others can access a room already established already by the teacher or someone else using the option 'enter a room'.

Chat rooms

Using these chat rooms, learners can interact synchronously with each other to share ideas, solve problems and work collaboratively on a project. Designing a chat system means designing a real-time and multi-user channel for communication via the Web. Although there are numerous chatting systems available which vary in their capabilities (using text, audio and video), most of them are not suitable, either technically or educationally, to the students' level or to be hosted in Wired Class Web server. However, suitable chatting systems were found to be too expensive to be used in small-scale educational applications or at schools. For these reasons, it was necessary

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Discussion boards

The discussion board is a virtual area where learners exchange their personal ideas and examine them against others' points of view. Using discussion boards, students can post and read messages addressing course-related information and problems. An investigation of discussion board programs available on the Web showed that using one of them in Wired Class would not be suitable to the students' level and discussion objectives. These discussion boards are 'threaded' discussions, which are suitable for debating more than one idea or topic in the same board. In addition, the thread style discussion was taught to be unfamiliar to students and it would not allow them to take advantage of messages presented under sub-titles or view all relevant information while commenting (Schoonenboom, 2002). For these reasons, a simple discussion board was designed and developed.

The design of the discussion board interface consists of two parts: The 'send' form and list of participants' messages to the board. This design allows the learner to submit his/her message to be added below at the top of the list. So, the learner can read others' messages to the board and compare his/her point of view against theirs. Technically, all posted messages are organised and saved in a HTML file in the Web server called a 'discussion file'. Every 'discussion file' in the server has a unique name. Every time the learner executes a discussion board script in the server side, the script generates an HTML page combining the HTML form (for inputs) and the specified 'discussion file' to appear on the same page in the user's browser.

On-line students' page (who is on-line?)

Since students access Wired Class at different times during the day, the on-line students' page presents a list of students who has logged-in to the class, with the time of logging-in/logging-out and links to those students' personal pages. The importance of this tool is that it allows the learner to know who is on-line while he/she studying, encourages students to contact each other and minimises the sense that everyone is studying alone.

4. Management and monitoring tools

Course administration refers to the different options available to the on-line tutor to manage his/her learning environment, enable/disable access rights of students, monitor students' progress and contact students. In Wired Class, management tools include control panel, student enrolment, students' grades and notice board.

Tutor's control panel

The control panel is a group of easy-to-use tools allows the tutor to manage, contact, support and monitor student's performance using the Web browser. Using the control panel the tutor is able to:

- send instant message to any student using his/her username only;
- ask one student or a group of students to contact him/her while they are studying;
- receive and organise students' messages in one window;
- send public messages to the entire class via the notice board;
- search and update the on-line library catalogue;
- monitor students' participation and participate in discussion boards;
- track students' pathway through Wired Class components and modules;
- turn on/off the feature of 'on-line tutor', allowing students to know whether the tutor is on-line or off-line;
- update student's grades in each lesson; and
- access Wired Class MS Access database to get information about student's performance and progress.

The control panel is used by the on-line tutor as long as he/she is available. At the start of any learning session, the tutor selects the 'Available' radio button then clicks the 'Update' button to inform students that he/she is on-line and able to receive and answer their questions. Messages sent by students appear at the bottom of the control panel and the tutor can reply to students instantly without leaving control panel or while doing other tasks.

In addition, since the tutor is not in direct contact with students and does not have traditional type records to monitor their performance and track their activities, the control panel allows the tutor to trace all site pages visited by the student, the number of tasks completed, tests taken and the time spent in learning the course material. Using this information, the tutor can encourage and support struggled students, diagnose students' difficulties and provide the appropriate feedback to every students.

Student enrolment

On-line student enrolment is one of the unique features that characterise Web-based learning environments. Unlike other media (such as television) the Web offers the possibility of enrolling students directly. Paper-based forms, post and telephone are replaced by HTML/CGI forms. In Wired Class, students are enrolled using a registration form, which requires the student to enter his/her personal information (e.g., name, gender, school, date of birth, etc.) and choose a username and password. In addition, the student is able to register him/herself in other services, such as e-mail. After registration, the student cane use his/her username and password every time he/she accesses Wired Class.

Student's grades

The student's marks page is a grade tool allows the learner to access his/her own grades in each lesson, as entered by the tutor. The grades page consists of two parts: the editor and the viewer. The editor allows the tutor to update the learner's grades page regularly using only the student's username. However, the viewer allows the learner to view his/her marks in previous lessons.

Notice board

Notice board is similar to the traditional class wallboard on which notices are fixed. In Wired Class, a need was perceived for a similar board on which the teacher and students could show their notices. However, although it was easy to specify an area in Wired Class to show the teacher's notices, it would not be practical for the teacher to receive and publish daily and weekly notices using the HTML editor. For this reason and to encourage learners to show their notices in Wired Class, a tool was designed to help the teacher and students to post their notes.

Using 'notice board editor', the teacher and students are able to post their notes only by filling-in a simple form. The notice board can be used for many purposes. The teacher could use it to arrange for on-line discussion or announce about new arrangements or changes in the class system. At the same time, students themselves could use the board to announce an event or indicate to a public event.

The figure below shows the relationship between these elements and explains how they work and facilitate learning and interactions.

Conclusion

In designing for the Web it was found that Web-based learning environments require the design and integration of various tutorial (e.g., modules and tests), management (e.g., schedule and grade distribution), interaction (e.g., e-mail and discussion boards) and support (e.g., on-line library and help topics) components that work together to enhance students' performance and interactivity of learning. In designing learning activities students need to pass through various cognitive activities and participate in self-based and collaborative instructional tasks (e.g., self-tests and discussion boards) to construct their learning.

ACKNOWLEDGEMENTS

This paper is based on the research conducted for my Ph.D. dissertation. Therefore, I am deeply grateful for Dr. Ken Spencer, Institute for Learning, University of Hull, UK for his supervision and valuable comments on this part of research addressed in this paper.

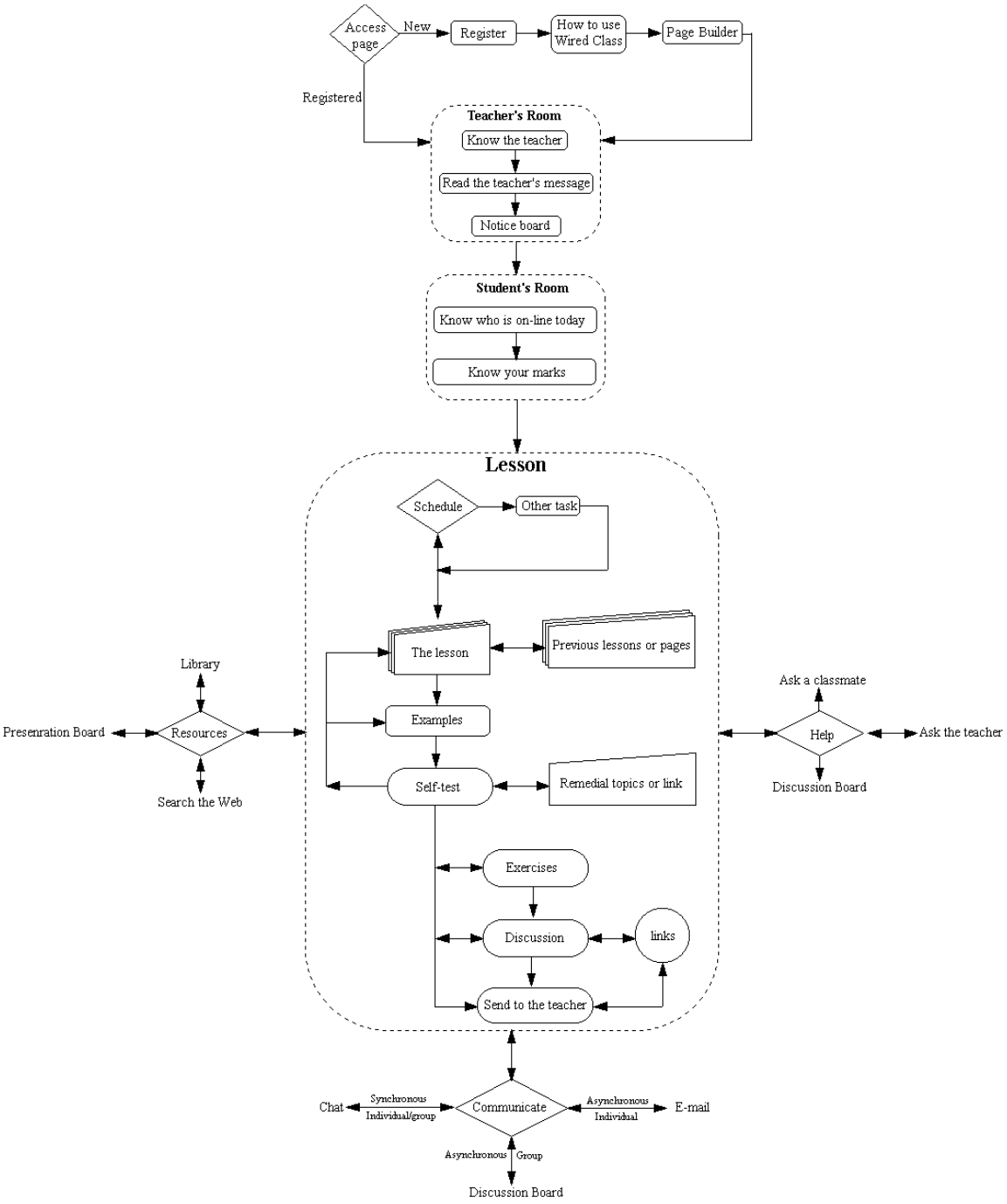

Figure 4. Elements of Wired Class

References

Angeli, C., Valanides, N. and Bonk, C. (2003). Communication in a Web-based conferencing system: the quality of computer-mediated interactions, *British Journal of Educational Technology,* 34(1), pp. 31-43.

Carr-Chellman,A. and Duchastel, P. (2000). The ideal online course. *British Journal of Educational Technology*, 31(3), pp. 229-241.

Carr-Chellman,A. and Duchastel, P. (2000). The ideal online course, *British Journal of Educational Technology*, 31(3), pp. 229-241.

Chou, C. (2003). Interactivity and interactive functions in web-based learning systems: a technical framework for designers, British Journal of Educational Technology, 34(3), pp. 265–279.

Dymock, D. and Hobson, P. (1998). Collaborative learning through audioconferencing and voicemail – A case study. *Distance Education*, 19(1), pp. 157-171.

Fisher, M. (2000). Implementation considerations for instructional design of Web-based learning environments, In Abbey, B., (Ed.) *Instructional and Cognitive Impacts of Web-Based Education*, London, Idea Group Publishing.

Goldberg, M. (1997). Using a Web-based course authoring tool to develop sophisticated Web-based courses, In Khan, B. (Ed.), *Web-Based Iinstruction*, Englewood Cliffs, Educational Technology Publications.

Harbeck, J. and Sherman, T. (1999). Seven principles for designing developmentally appropriate Web sites for young children, Educational Technology, 39(4), pp. 39-44.

Harrison, N. and Bergen, C. (2000). Some design strategies for developing an online course.

Educational Technology, 40(1), pp. 57-60.

Harrison, N. and Bergen, C. (2000). Some design strategies for developing an online course. *Educational Technology*, 40(1), pp. 57-60.

Hites, J. and Ewing, K. (1997). Designing and Implementing Instruction on the World Wide Web: a Case Study. Center for Information Media, Retrieved February 13, 2002 from http://lrs.stcloud.msus.edu/cim/cimindex.html

Huang, H. (2000). Instructional technologies facilitating online courses. *Educational Technology*, 40(4), pp. 41-46.

Macdonald, J. and Twining, P. (2002). Assessing activity-based learning for networked course. *British Journal of Educational Technology*, 33(5), pp. 603-618.

McConnel, D. and Sharples, M. (1983). Distance teaching by Cyclops: an educational evaluation of the Open University's telewriting system. *British Journal of Educational Technology*, 14(2), pp. 109-126.

Oliver, R. (1999). Exploring strategies for online teaching and learning. *Distance Education*, 20(2), pp. 240-254.

Powell, G. (2001). The ABCs of online course design. *Educational Technology*, 41(4), pp. 43-47.

Ryder, M.(1996). *Affordances and Constraints of the Internet for Learning and Instruction*, Paper presented at a joint session of the Association for Educational Communications Technology, Brent Wilson University of Colorado at Denver.

Schoonenboom, J. (2002). A template for discussing large texts on the Web: the Pragglejaz site, Colloquium. *British Journal of Educational Technology*, 33(1), 103-107.

Simpson, O. (2000). *Supporting Students in Open and Distance Learning*. Open and Distance Learning Series, London, Kogan Page.

Weston, T. and Barker, L. (2001). Designing, implementing, and evaluating Web-based learning modules for university students. *Educational Technology*, 41(4), pp. 15-22.

Wise, N. (1996). Using technology to integrate learning into the real world. Paper presented to Australian Computers in Education Conference, 9-12 April, Canberra.

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Editor's Note: Bulletin Boards, threaded discussions, and conferences are names commonly used for asynchronous online discussions. They stimulate interaction and sharing of information, and are the backbone of many distance learning programs. They can be augmented by other asynchronous media such as email, or by synchronous media such as chat, netmeeting, and telephone.

Peter Theodore and Wayne Nelson studied five distinctive features of asynchronous discussions. The results are of value for stimulating discussion and for planning bulletin board discussions

Distinctive Features of Computer-Mediated Bulletin Board Discussions

Peter A. Theodore and Wayne A. Nelson

Keywords: computer-mediated communication, asynchronous discussions, bulletin board discussions, higher education, student experiences, student interaction, logical argument, multiple perspectives, student expression, interactive learning, collaborative learning, student- centered learning

Abstract

This study involved a qualitative investigation of bulletin board discussions that were part of two university classes. The study sought to determine the distinctive features of the discussions that might have facilitated interaction and learning processes among students. Five distinctive features of the asynchronous discussions were identified as a result of analysis of the discussion transcripts: references to personal experience, interaction, logical argument, multiple perspectives, and the expression of opinion. The results of this study can help educators make more effective use of bulletin board discussions to facilitate student interaction while learning.

Introduction

Efforts to provide online learning experiences for students at nearly all levels of education have increased in recent years. Possibilities for online learning are numerous, whether structured as formal "courses" or as informal opportunities made possible through online libraries, special-interest discussion boards, peer networks, etc. Such opportunities help students overcome obstacles of time and distance that might impede their studies. Some believe that networked learning technologies will revolutionize the ways that people communicate and learn in the future (e. g., Harasim, 1993; Negroponte, 1995). Notwithstanding these benefits, however, there have been a number of issues and questions raised about how online learning can best be designed and supported in Internet-based courses. More and more teachers and institutions are becoming interested in the possibilities of online learning, and they seek guidance in terms of how to proceed. While research in this area is growing, there are still many questions to be addressed. In particular, there are many who question the quality of online learning activities, noting that teaching through the Internet is not the same as delivering content through the Internet (Foshay & Bergeron, 2000).

The Internet provides excellent capabilities to structure and deliver content and information. There are well-established principles for organizing content, designing strategies for assuring individual student interaction with the content, and assessing learning outcomes that result from these interactions (e. g., Reigeluth, 1999). But learning requires more than just interaction with

content by an individual learner (Moallem, 2003). There are social dimensions to learning that need to be considered, and that lead to knowledge and meaning that is constructed by social communication and distributed across the members of a group (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991). Many theorists and researchers assert that learning requires significant communication and interaction with others, and networked computer technologies provide important tools to help distribute ideas to members of a learning community (Koschmann, 1996; Lea, 1992; Wellman, Salaff, Dimitrova, Garton, Gulia, & Haythornthwaite, 1996).

Options for such communication are numerous and growing, including e-mail, bulletin boards, conferencing systems, whiteboards, chat rooms, audio "broadcast" technologies, and desktop videoconferencing. But availability of such tools does not guarantee use by students (Berge, 1999), in part because the communication is text-based in many of the tools (and therefore passive), and because there are significant differences between face-to-face and asynchronous communication (Roschelle & Pea, 1999). Nonetheless, the sort of interaction that supports collaborative learning in face-to-face situations has also been shown to occur in online learning (e. g., Curtis & Lawson, 2001), and some believe that the opportunities for interaction and reflection offered by networked communication media offer new opportunities for student learning (Warschauer, 1997).

The kinds of Web-based discussions that might occur in online learning situations can contribute to learning in many ways, from rehearsal and memorization of facts through deep insight or creative thought. So while it is suggested that communication is essential for successful online learning, it is less clear how different types of communication and the depth of communication may impact learning. In Web-based discussions using bulletin board communication tools, it has been noted that various levels of discussion will take place (Jarvela & Hakkinen, 2000; Jenlink & Carr, 1996). Lower-level discussions (Jarvela & Hakkinen, 2000) mainly contain individual opinions and statements that disregard the earlier posted discussions. This might be classified as "monolog" (Jenlink & Carr, 1996). A second level of web-based discussion has been termed "progressive" (Jarvela & Hakkinen, 2000), where there is some cross-referencing of comments, and experience-based postings are interspersed with new points or questions. Conversation theorists might refer to such discussions as "dialog" (Jenlink & Carr, 1996). Finally, deeper-level discussions (Jarvela & Hakkinen, 2000) typically contain rich cross-referencing, mutual negotiations, and theory-building interactions. Such discussions attempt to distill truth or correctness through logical argument and analytical thought.

Given this background, the current study was designed to determine the kinds of interactions that might occur in an "open" communication environment that employs computer-based bulletin board communication tools. The study was "open" in the sense that no definite strategies were to be employed by the instructor to facilitate communication among students. The research question being investigated was therefore very broad. Simply put, without any specific questions, suggestions, or requirements from an instructor, how will students use bulletin board communication tools to facilitate and support their learning? The results of this study should help to better delineate the various ways that learners interact within online learning environments that use bulletin boards as communication tools. While other studies have identified some features of bulletin board discussions, they have not provided a rich portrayal of how these features appear in actual discourse. This study should also give instructors some insight into the kinds of strategies that might be employed to facilitate interaction using these online tools.

Methodology

Participants

Two university classes that took place at a private, religiously affiliated university in the Midwest were the focus of this investigation. Participants include 17 students enrolled in an Instructional Technology class and 24 students enrolled in a Human Growth and Development class. Both classes were required courses for undergraduate education majors who were planning to become K-12 teachers.

Participation in the bulletin board discussions was a requirement in both classes, though students were informed of their right to have their individual contributions exempted from inclusion in any report of the research. While no explicit instruction in how to proceed with the discussion was given, students were trained in the use of the tool as a communication medium.

Procedures

The online discussions began during the first week of the course and continued throughout the 15-week semester. Discussion threads on the bulletin board were initiated both by the instructor and by students. Transcripts of the bulletin board discussions for the two classes were created by saving all posts in order to provide a record of what was actually "said" in the discussions. These transcripts were subjected to a qualitative analysis in order to discover something about what the "distinctive features" of these discussions were, following established qualitative research procedures (Glesne & Peshkin, 1992; Marshall & Rossman, 1994; Strauss & Corbin, 1990). The analysis involved repeated readings of the transcripts, initially to get an overall impression of what sort of discourse seemed to be occurring, and subsequently to code the student posts as instances of particular elements within that discourse. For example, if the content of a post indicated that a student was consciously aware of and interacting with other students, that post was coded with an "I" for interaction. New codes were added when new data were found in the transcripts that indicated a different type of interaction. The process of reading and coding continued until no new types of interaction could be identified, indicating that the analysis had reached the point of "theoretical saturation" (Strauss & Corbin, 1990).

Results and Discussion

The raw transcripts of student discussions consisted of 307 student contributions (or posts), totaling approximately 50,000 words. Based on the analysis of the student posts, five categories were determined. The categories, and the number of posts that were identified as belonging in each category, are summarized in Table 1.

Table 1.
Number of posts in each category
(a single post could be included in more than one category)

	Personal Experience	Interaction	Logical Argument	Multiple Perspectives	Opinion
Instructional Technology -110 total posts	27 (25%)	51 (46%)	31 (28%)	45 (41%)	61 (55%)
Human Growth and Development -197 total posts	107 (54%)	103 (52%)	70 (36%)	98 (50%)	125 (63%)
Combined - 307 total posts	134 (44%)	154 (50%)	101 (33%)	143 (47%)	186 (61%)

With regard to the quotations from the transcripts that are used below to illustrate the findings, the entire text of some posts does not appear, though the quoted portion itself is intact unless specifically noted. Pseudonymous initials have been substituted for student names and blank lines have been substituted for names of non-students or places referred to by students in their posts. Otherwise the words appear just as they were posted to the discussion board.

Personal Experience

The first theme to emerge while coding the posts was the inclusion by students of references to their own personal experience. Of the total of 307 student posts, 134 (44 percent) were found that included some sort of reference to personal experience, as in this example:

> *My dad was never really around when I was growing up and it left me a bit unstable and extremely resentful. I think it is important for both parents to be at home as much as possible. But, I also think that if the parents cannot be there then someone else can take their place in a sense. I am a nanny and I have been working with the same family for a year now. I have been with _____ since he was born. I am not a parent but I do have many of the same responsibilities as parents do. _____feels very secure with me and his face lights up as soon as he sees me everyday. Both of his parents have wonderful relationships with him as well. They spend as much time as they can with all their children. I happen to think that _____ is lucky to have so many people that love him. I just happen to be a third attachment of his. (SN, 2/2/2000)*

Some of the references to personal experience were quite brief, and therefore were not especially revealing or emotionally charged, such as the following:

> *My thoughts exactly! I think that's what happened to me. I got quite caught up in my grades--especially in high school--so much that I never really enjoyed what I was doing! As a teacher, I hope I can prevent that. The Internet seems to be a great way to get connected with what interests you. (EF, 1/27/2000)*

On the other hand, the references to personal experience could be very revealing and emotionally powerful, as here:

> *I think telling your family members you love them and making sure all of them know how much they mean to you is so important. When my grandmother died it was always never really clear if she was going to be fine or if she was going to die. We all knew she was sick but didn't really know how much time she had left. No one talked about dying because we were all so optimistic. By the time we knew how long she had left she was comatose and we only had two days with her. It made that separation so hard on all of us. I had nightmares for weeks afterwards because I never got to say goodbye or tell her how much she meant to me. Because of that I always tell my friends and family how important they are. I don't care if death is a morbid topic. You never know how long you have on earth and it's more important that someone knows how you feel that skirting a touchy subject. AB (AB, 5/3/2000)*

References to personal experience appear to have depended, at least in part, upon course content. In the Instructional Technology class, 27 out of 110, or 25 percent, of the posts referred to personal experience. In the Human Growth and Development class, 107 out of 197, or 54 percent, of the posts referred to personal experience. The Human Growth and Development course may have included more topics that elicited references to personal experience. In comparison, the smaller number of references to personal experience in the Instructional Technology class indicates that the nature of the bulletin board discussion may be influenced by

its content, and that the sort of influence it has on collaborative learning will depend, at least in part, on the topics being discussed.

Course content alone, however, does not seem sufficient to account for the prevalence of references to personal experience on the bulletin board. Even in Instructional Technology, fully one fourth of student posts made such references. For example, the following excerpt is from the Instructional Technology class:

> *I have a six year old sister and my parents both work and at very different times. They have computer programs for her and at times they do just sit her in front while they do housework. I can see how special it is when I sit down with her and we read together, or when I see my mom or dad read to her. She becomes so alive and excited. When she comes from behind the computer screen she seems lonely.*

Despite the relatively less personal content of Instructional Technology, the bulletin board still seems to have elicited quite personal references from students. Indeed, given the deeply personal nature of some of the experiences related on the bulletin board, and that 44 percent of total student posts made reference to personal experience, it seems reasonable to conclude that the bulletin board discussion can encourage this sort of sharing, and will facilitate the inclusion of personal experiences in collaborative learning processes.

Interaction

The next category of student posts that was noted was the indication of interaction in the posts. Posts were coded as having an element of interaction when the student made some sort of direct reference to the others in the class, explicitly interacting with the others in the group in the way the post was worded. This type of post, as well as the "personal experience" type of post discussed above, might belong to the "monolog" or lower-level discussion types posited in the literature (Jarvela & Hakkinen, 2000; Jenlink & Carr, 1996). A total of 154, or 50 percent, of the 307 student posts were coded in this way. The examples below will help to clarify the sorts of posts that were considered interaction.

> *Hey everyone! I just wanted to try to continue the discussion we were having on nature vs. nurture and other factors that influence development. Although I do not take a strong stand on either position, I am curious to understand how people who claim that nature controls development support this view. When I examine myself, I tend to see many more environmental factors that have shaped my life. Even influences that may be considered genetic, such as the color of my skin, are still largely affected by cultural experiences and how society places value upon them. What do you think? Do you find that your life has been shaped more by heredity or environment? (CM, 1/18/2000)*

> *I was wondering if anybody had the same results on the nametag activity as I did. I basically had the same responses for three of the four questions on both the nametags. The only question that I had different was "Where I would like to go?" The other activity was pretty interesting too. I thought Tuesday's class was one of the best classes of the semester. See you guys in class tomorrow. (PV, 3/29/2000)*

Unlike references to personal experience, the element of interaction in student posts does not seem to have been dependent upon course content. Approximately half the posts in each class, 46 percent in Instructional Technology and 52 percent in Human Growth and Development, contained an element of interaction. Phrases such as "Hey everyone!," "What do you think?," and "See you guys in class tomorrow." indicate that students felt themselves to be interacting with their classmates when they posted a message to the bulletin board. This promotion of interaction is another important way that the bulletin board discussion facilitates collaborative learning.

Logic

Many instances of students taking a position and supporting it with a reasoned argument, or of using logic to discuss different sides of an issue, were noted in the transcripts. These interactions may be of the type described in the literature as "dialog" (Jenlink & Carr, 1996) because of the exchange of points of view supported by logical arguments. Out of the total of 307 student posts, 101 posts, or 33 percent, were identified that involved expressing one's point of view and supporting it in a logical manner. As with the element of interaction, the percentage of posts involving logic was not very different between the two classes. In the Instructional Technology class, 31 out of 110 posts, or 28 percent, were coded for logical argument, and in the Human Growth and Development class, 70 out of 197 posts, or 36 percent, were so coded. Following are some examples of what was seen as occurrences of logical reasoning in student posts.

> *I also agree that people learn best when they are interested in the subject matter and when they are working not only to get a grade or complete a project but to fulfill their own interests. It is not only the end result that is important in education but also the process. A student learns much more while doing research on a topic such as extra information and methods of researching than what is included in a final report. When a person finds their work interesting, often it ceases to be work and becomes fun and intrinsically rewarding. (WH, 1/18/2000)*

> *The classroom creates an environment in which children are forced to function against their nature. A child is constantly learning and exploring, and the classroom forces them to sit and try to be passive. If I found a child who liked to sit still for seven hours a day and never move, I would be extremely worried. Ritalin is destroying childhood, because being a kid is all about being excited and tactile and using the imagination. By using Ritalin, we are taking away a vital part of the experience of growing up. Our society expects children to act like adults, and if children don't comply, we drug them so they do. Does this sound incredibly dangerous to anyone else besides me? (VB, 3/2/2000)*

Instances of logical argument were typically brief, as in the examples above. On occasion, however, a student would present and defend a position by contributing a rather lengthy argument to the bulletin board discussion. An example of the sort of extended logical argument that could appear on the bulletin board is shown below. The article referred to in this post was a magazine article that reported on the practice of young women selling their eggs at high prices to infertile couples.

> *This article disturbed me for several reasons, and if you will all bear with me, I will attempt to articulate how I feel.*

> *First of all, I have nothing against using technology to aid those people who otherwise could not have children. I agree with what AB said, in that God would not argue with people using their God-given intelligence in order to assist them with their reproductive problems. However, this article made me sick to my stomach.*

> *The attitude of Ms. _____ really paints a dark and disturbing picture of the reproductive "industry" (for lack of a better term). She just does not care that a part of her is being put on the open market and sold to the highest bidder. She feels no need or obligation to have any moral connection with this child. Organ trafficking is illegal in every civilized nation on this planet. I do not see how this is allowed to continue.*

> *My next qualm is the utter disregard that Ms. _____ has for her own biological well-being. What if ten years down the road, she wants to have children of her own, and her ovaries are too scarred, drugged, and damaged for this to be possible? What if twenty years down the road, medical science shows that women who donated eggs have an*

extremely high incidence of ovarian cancer, one of the fastest acting cancers that exists, with almost the lowest survival rate? What if, at the end of her life, she is filled with deep regret about the fact that maybe she donated for the wrong reasons? Or is she so concerned with MONEY that these things never occurred to her?

There was one sentence in this article that simply made my jaw drop to the floor. "He (_____) said that he saw nothing wrong with a client's paying premium rates for hard to come by goods." Goods????!!!! We're not talking about a rare work of art or an expensive old car; this is a HUMAN LIFE, an entity which supersedes any material object. I cannot say how I really feel about this in a public forum, because my tone would be way too angry, so I'll move on. Let me just say this: this article was written from a very obviously pro-choice standpoint. I would be interested to see how the other half, pro-life advocates (which I am one of) think of this issue.

Finally, I would like to address the subject of the "investment" idea. This also ties together with the concepts of pre-natal care which we discussed in class. What would happen if a couple paid all this money to obtain a donor egg, then found that when the child was born, they were unhappy with the results? What if the athletic parents had a child who was interested in things other than sports? What if a couple wanted a child to continue their family line, and their child turned out to be homosexual? What if a couple had an amniocentesis during the pregnancy and found out that their child had a developmental defect? I'm sure all of these things have probably happened. Does this change the parents' attitude? If a person is willing to cheapen life down to the level of a material "product," what is to prevent such a person from abusing a child who does not live up to the genetic expectations that the parents paid for?

For life to be lowered to such a low state disturbs every moral fiber in my soul. I have had personal experience with close family members who had problems having children. Knowing the pain and anguish they went through for years--having three miscarriages, waiting long years for adoptions to go through, wading through miles of red tape, and finally being blessed with a child--I cannot believe that there are people out there who would take advantage of this deep emotional anguish so they could make a buck. Thank you for reading this. I know it was rather long, but I had to say what I felt about this or I was going to explode. –VB (VB, 2/3/2000)

The prevalence of this sort of logical argument on the bulletin board is evidence that the bulletin board exhibits in combination some of the qualities of both oral and written communication. The tendency to argue for a particular point of view is a characteristic of oral conversation, and the development of such an argument in a linear, logical manner is a characteristic of writing (Ong, 1982). This combination on the bulletin board discussion brings discourse that is both disputatious and linearly structured into the service of collaborative learning.

Multiple Perspectives

Another distinctive feature of electronic bulletin board communication is the “threaded” nature of the medium that seems to encourage and support multiple perspectives on various topics of discussion. In this study, several students, each with a different point of view on a subject, presented their positions in posts to the bulletin board. As a result, the bulletin board contained a multi-faceted presentation of this subject, making multiple perspectives available to all who read the bulletin board. Students made 143 posts, or 47 percent of the total of 307 student posts, that could be coded as presenting multiple perspectives on some issue. As with the elements of interaction and logic, the percentage of posts presenting multiple perspectives was not markedly different in the two classes. In the Instructional Technology class, 45, or 41 percent, of the total of 110 posts were coded for multiple perspectives, and in the Human Growth and Development

class, 98, or 50 percent, of the total of 197 posts were so coded. As was the case with interaction and logical argument, the difference between the two classes seems to indicate that the content of the courses was not an important factor. The following excerpts from a discussion about the use of Ritalin provide an example of the sort of posts that were seen as presenting multiple perspectives.

> *I am writing on the idea of Ritalin in young children. My personal opinion is that in the past I have seen children who are on Ritalin and to me they seem to be a totally different person. For example, a child on Ritalin (in the case that I have seen) was very quiet and withdrawn, when normally they were more outgoing and talkative. I realize it is different for each child, but I do not understand why we have a need to control one's behavior with medication. It almost shows that as a society we are lazy and do not want to deal with our children when they may cause us to put in extra time. (EL, 2/29/2000)*

> *One of my education professors brought up the fact once that what did we do before there was Ritalin? And, is it really that we now have greater knowledge that we can diagnose things such as ADHD or is it something our society has created? With all of the television and video games, have we created a generation of children who cannot sit still? And then when they don't sit still we label them with a learning disorder and put them on medication to stop their excitable behavior. I think that one of the most charming aspects of little children is their energy and enthusiasm. I think people are entirely too quick to use Ritalin instead of looking into other options such as one on one interaction or classroom adjustments like Mr. Theodore was suggesting. Ritalin has become an easy way out for many parents and teachers so they don't have to put additional time or effort into certain students. AB (AB, 3/1/2000)*

> *I will admit that drugs may be overused in some cases, but to generalize to all of them seems a little harsh. It seems to me that some children do need drugs to help them. It would not be fair to stop giving children Ritalin if it would help them learn. It hurts a child's self esteem when they are not learning things with the rest of the class. How can they learn unless they can use the drugs to focus and not be jumping around the room and causing distractions? If children are allowed to use them when needed, they are more likely to stay up with the class and what they are learning. I know that when I was in grade school, kids who were having problems such as ADHD often went to the public school so that they could get more help learning because the private school did not have spec. ed. One of my friends was one of those children. She was made fun of because she could not hack it. (TE, 3/2/2000)*

Two features of the bulletin board as a medium, that the conversation remains in place and that it is organized by topic, seem likely to have facilitated the presentation of multiple perspectives on topics. Students could easily read what had already been posted on a given topic, viewing whatever perspectives were presented. It seems likely that this reading would help a student clarify his or her own point of view, and encourage the student to add it to the ones already posted. Thus, regardless of course content, the bulletin board seems to bring multiple perspectives to the collaborative learning process.

Opinion

The final aspect of student posts that was noted in the analysis was the statement of an opinion on some topic. Of the 307 student posts, 186 posts, or 61 percent, were identified as containing the expression of an opinion. As with all of the other codes except for personal experience, there was not a large difference in the percentage of posts between the two classes. In the Instructional Technology class, 61 out of 110 posts, or 55 percent, were coded for opinion, and in the Human Growth and Development class, 125 out of 197 posts, or 63 percent, were so coded. These posts

were distinguished from logical arguments because students simply stated their opinions without supporting it with arguments. Some examples of the sorts of posts coded for opinion follow:

> *I think that computers and the Internet are an essential element of every classroom. I want to teach 1st or 2nd grade and I feel that it is important to introduce children to computers and other technology at an early age. In my classroom I would encourage the children to explore the computer by letting them play computer games, typing programs, art/design programs, etc. I would also use the computer to type the students' stories that they write so that they could see how a word processor works. This would allow the children to become familiar with and understand the many uses of a computer. Once the children felt comfortable on the computer I would introduce the Internet and let them see how it is used (this would be supervised). 1st grade might be a little too young to understand how to use the Internet, so I would only bring this into the classroom if I felt it was appropriate. Overall I would encourage all teachers to find ways to utilize computers and other technology in the classroom. Teachers and students can benefit from this. (OC, 2/7/2000)*

> *CM, I agree wholly with you. Using medication to unnecessarily govern young children's behavior is terrible. I mean if we are going to sedate our children, why not use something that will really work? How about some heroin? That should keep them silent. Forgive the sarcasm, but I think this is something to stop. MW (MW, 2/24/2000)*

> *I don't think that I will fully become an adult until I have children of my own to take care of. I know that I do not want to be an adult until then. I have adult responsibilities and they are definitely not my most favorite things to do. We also have to remember that adulthood is a process with many stages--all are not reached at the same time. TE (TE, 4/13/2000)*

The expression of opinion was the most common characteristic found in student posts, occurring in over half the posts in both classes. Students seemed to situate themselves as distinct individuals within the bulletin board discussion, making clear where they stood on the topics under discussion. It seems likely that being alone in front of the computer is less intimidating than being face-to-face with another person, and that this greater degree of comfort facilitated the expression of personal opinion. Also, the fact that one has the opportunity and time to read and understand another's point of view may improve the clarity of one's own position. Getting students involved with one another in this manner is one more way the bulletin board discussion facilitates learning.

Conclusions and Recommendations

The bulletin board discussion appears to combine some of the key characteristics of oral and written communication (Ong, 1982). Participants get personal in the context of the bulletin board discussion in the same way that they would get personal in a face-to-face conversation. They show emotion, interact with each other, and share personal stories. At the same time, the fact that the bulletin board conversation remains in place to be read imbues it with some of the qualities of writing. Participants are able to read and contribute at any time, regardless of when others have been involved, and contributions often have the coherent, logical development of a written work.

Both of these dimensions of the bulletin board discussion, the "oral," interactive dimension and the "written," logical dimension, are important aspects of learning. In addition to providing evidence that interaction among students is a regular feature of their participation in the bulletin board discussion, the present study reveals something of the quality of those interactions. The data indicate, for example, that the sharing of personal experience tends to be a substantial part of

discussion on the bulletin board, and that course content seems to influence the frequency of this sharing. This suggests that courses in which the relation of students' personal experiences to course content would be particularly valuable would benefit from the incorporation of bulletin board discussions, and that students should be encouraged to include these experiences into their posts.

Instructors could encourage the sharing of personal experience by posing questions on the bulletin board that are aimed at eliciting references to that experience, such as: "What have you experienced in your own life that relates to x?" The sharing of personal experiences on the bulletin board can also be encouraged by what the instructor says during face-to-face class meetings, such as: "You may want to discuss your thoughts about y further on the bulletin board. One good way to approach this would be to discuss any experiences you have had that relate to y."

Interaction on the bulletin board can also be encouraged by explicit recommendations from the instructor, such as reminders that the bulletin board is there as an opportunity for students to talk to each other, rather than a place to respond to the instructor. Group discussions can be begun in the classroom, and then ended while there is still some energy in them; the instructor can suggest that the discussion be continued on the bulletin board.

The present study also found that the bulletin board discussion facilitated the presentation of multiple perspectives on issues. Courses involving complex content that requires the consideration on many perspectives in order to be adequately understood would seem to benefit from the incorporation of bulletin board discussions as part of an effort to support learning among students.

Finally, the incorporation of logical argument in student posts seems to be a particularly valuable contribution made to the learning process by the bulletin board discussion, as students are likely to develop their own thinking as they construct logical arguments and to learn from reading the logical arguments of their peers. The combination of disputative interaction, similar to what could take place orally, with extended linear argument, which tends to require written text both to be constructed and to be understood, seems to be a unique feature of the bulletin board discussion. Courses where the construction and exchange of logical arguments would be relevant would seem to be especially well suited for the incorporation of bulletin board discussions.

To take full advantage of this convergence of oral disputation and linear argument on the bulletin board, it is recommended that controversial topics be deliberately introduced into the discussion. If students are presented with issues about which they genuinely disagree, they are more likely both to construct arguments for their own point of view and to enter into disputation with others. It will be very important, of course, to give students guidance about how to disagree with each other in a productive and respectful manner, emphasizing that the goal is a mutual search for enlarged understanding, and that no one person is likely to have the whole truth. Discussion of genuinely controversial issues will also facilitate the presentation of multiple perspectives and the expression of opinion.

In general, it seems that the incorporation of bulletin board discussions ought to be considered in courses where collaborative learning is desired, where the goal is for students to learn from each other as well as from the instructor and course materials. Furthermore, it is apparent that particular aspects of interaction on the bulletin board discussion, such as the inclusion of personal experience, the presentation of multiple perspectives, and the development of logical arguments, might be suggested to students. Further research, both quantitative and qualitative, focusing on the five categories discussed in the present study, is indicated, both to provide further support for the validity of the categories as constructs and to provide a more thorough picture of just how these qualities of student discourse contribute to collaborative learning.

References

Beller, M., & Or, E. (1998). The crossroads between lifelong learning and information technology: A challenge facing leading universities. Journal of computer-mediated communication [On-line], 4(2) Available: http://jcmc.huji.ac.il/vol4/issue2/beller.html

Berge, Z. L. (1999). Interaction in post-secondary Web-based learning. Educational Technology, *35*(1), 5-11.

Brandon, D.P., & Hollingshead, A.B. (1999). Collaborative learning and computer-supported groups. Communication education, 48(2), 109-126. Retrieved February 21, 2003, from WilsonSelectPlus_FT.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. Educational Researcher, *18*, 32-42.

Curtis, D.D. & Lawson, M.L. (2001). Exploring collaborative online learning. Journal of Asynchronous Learning Networks (JALN) 5(1), 21-34.

DeMulder, E. K., & Eby, K. K. (1999). Bridging troubled waters: Learning communities for the 21st century. American Behavioral Scientist, 42(5), 892-901.

Foshay, R., & Bergeron, C. (2000). Web-based education: A reality check. TechTrends, 44, 16-19.

Glesne, C., & Peshkin, A. (1992). Becoming qualitative researchers: An introduction. White Plains, NY: Longman.

Harasim, L. M. (1993). Global networks. Cambridge, MA: MIT Press.

Hardcastle, G. L., & Hardcastle, V. G. (1998). Electronic communities in philosophy classrooms. In Electronic communication across the curriculum, Reiss, D., Selfe, D., and Young, A., eds. (282-295). Urbana, IL: National Council of Teachers of English.

Jarvela, S., & Hakkinen, P. (2000). Levels of web-based discussion: Theory of perspective-taking as a tool for analyzing interaction. In B. Fishman & S. O'Connor-Divelbiss (Eds.), Fourth International Conference of the Learning Sciences (pp 22-26). Mahwah, NJ: Lawrence Erlbaum Associates.

Jenlink, P., & Carr, A. A. (1996). Conversation as a medium for change in education. Educational Technology, *36* (1), 31-38.

Koschmann, T. (Ed.). (1996). Computer-supported collaborative learning: Theory and practice. Mahwah, NJ: Lawrence Erlbaum Associates.

Koschmann, T. (1999). Toward a dialogic theory of learning: Bakhtin's contribution to understanding learning in settings of collaboration. Proceedings of the Computer Support for Collaborative Learning (CSCL) 1999 conference, C. Hoadley & J. Roschelle (Eds.) Dec. 12-15, Stanford University, Palo Alto, California. Mahwah, NJ: Lawrence Erlbaum Associates. Retrieved February 20, 2003, from http://kn.cilt.org/cscl99/A38/A38.HTM

Lave, J., & Wenger, E. (1991). Situated learning and legitimate peripheral participation. Cambridge, UK: Cambridge University Press.

Lea, M. (Ed.). (1992). *Cont*exts of computer-mediated communication. New York: Harvester Wheatsheaf.

Love, P. G., & Love, A. G. (1995). Enhancing student learning: Intellectual, social, and emotional integration. Washington, D.C: The George Washington University.

Marshall, C., & Rossman, G. B. (1994). Designing qualitative research, 2nd ed. Thousand Oaks, CA: SAGE.

Moallem, M. (2003). An interactive online course: A collaborative design model. Educational Technology Research and Development, *51*(4), 85-103.

Negroponte, N. (1995). Being digital. New York: Vintage Books.

Ong, W. J. (1982). Orality and literacy: The technologizing of the word. London; New York: Methuen.

Privateer, P. M. (1999). Academic technology and the future of higher education: Strategic paths taken and not taken. The Journal of Higher Education, 70(1), 60-79.

Strauss, A., & Corbin, J. (1990). Basics of qualitative research: Grounded theory procedures and techniques. Newbury Park, CA: Sage.

Quick, R. (2000). The Heartfield project. T.H.E. Journal, 28(5), 40-45.

Reigeluth, C. M. (Ed.). (1999). Instructional Design Theories and Models, Volume II: A New Paradigm of Instructional Theory. Marwah, NJ: Lawrence Erlbaum Associates.

Ritchie, G., & Peters, S. (2001). Using narratives in conferences to improve the CMC learning environment. Journal of Computer Assisted Learning, 17, 376-385.

Roschelle, J. & Pea, R. (1999). Trajectories from today's WWW to a powerful educational infrastructure. *Educational Researcher*, 8(5), 22-25.

Veerman, A.L., Andriessen, J.E.B., & Kanselaar, G. (1999). Collaborative learning through computer-mediated argumentation. Proceedings of the Computer Support for Collaborative Learning (CSCL) 1999 Conference, C. Hoadley & J. Roschelle (Eds.) Dec. 12-15, Stanford University, Palo Alto, California. Mahwah, NJ: Lawrence Erlbaum Associates. Retrieved February 20, 2003, from http://kn.cilt.org/cscl99/A77/A77.HTM

Warschauer, M. (1997a). Computer-mediated collaborative learning: Theory and practice. Modern Language Journal, 81(3), 470-481, Retrieved May 28, 2003, from WilsonSelectPlus.

Warschauer, M. (1997b) Computer-mediated collaborative learning: Theory and practice. Retrieved March 4, 2002, from http://www.gse.uci.edu/markw/cmcl.html

Wellman, B., Salaff, J., Dimitrova, D., Garton, L., Gulia, M., & Haythornthwaite, C. (1996). Computer networks as social networks: Collaborative work, telework, and virtual community. Annual Review of Sociology, *22*, 213-238.

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Editor's Note: From a practical perspective, companies need data to support effectiveness and cost-benefits of e-learning as compared to traditional training programs. One advantage of e-learning is that recorded data can be used for continuous quality improvement.

A Pilot Study Regarding Educational Effectiveness of Web-Based E-Learning

Vincent Kwisnek and Sharon Miller

Key Words: Business, Company, Computer-based e-Learning, Corporation, Distance Education, Educational Effectiveness, Educational Technology, Electronic Mail (Email), Evaluation, Instructor-led Training, Internet, Project, Research, Survey, Web-based e-Learning

Introduction: The Company's E-Learning Initiative

The Fortune 500 Company for which the pilot study was completed is headquartered in Pennsylvania, and has facilities located around the world. With a workforce of 30,000 employees and an emphasis on manufacturing, an important goal of the company is to operate the safest possible workplace environment. To best meet this goal, the company has utilized face-to-face instructor-led training to convey safety and health practices and requirements. According to Merrill Douglas, author of the article "E-volution at Corporate U (2003)," many businesses are seeking training methods that will, "…save money; reduce travel, educate large, dispersed work forces; and deliver training exactly when employees need it (¶. 3)." This company is no exception, as it sees effective, economical safety and health training as a way to remain competitive as a manufacturer and reduce employee turnover. Safety and health training needs to provide flexibility so that employees may complete the training at their convenience.

Computer-based e-Learning and web-based e-Learning were seen as solutions, so the company purchased and developed safety and health training modules. When compared to traditional instructor-led training, web-based training can be self-paced, highly interactive, result in increased retention rates, and reduce travel costs for either trainer or employees. The company defined computer-based e-Learning as computer-based training accessible *independent* of the internet or intranet, and defined web-based e-Learning as any computer-based training *dependent* upon access to the internet or intranet. When compared to computer-based training, web-based training provides easy access to the content and requires no distribution of physical materials. This means that web-based training yields additional benefits over computer-based training, among them:

- Access is available anytime, anywhere, around the globe.
- Per-employee equipment costs are lower.
- Employee participation and completion can be more easily tracked.
- Possible "learning object" architecture supports on-demand, personalized learning.
- Content is easier to update. (Kruse, 2002, Art. 1.9, ¶ 1)

Though the company has no conclusive evidence that the seven items listed below are benefits of using web-based e-Learning, it is utilizing web-based e-Learning as a way to meet the following objectives:

- Minimize potential litigation liability through meeting governmental training requirements.
- Rapidly deploy knowledge about the company's products and services across the business to support strategic cross-selling.
- Share support services so that the company can avoid redundant technology investments and streamline administrative processes.
- Encourage a cultural shift from location-based collaboration to cooperative teamwork between locations.
- Enhance morale and motivation through providing accessible, timely, and individualized learning for employees.
- Attract and retain top talent by providing effective training that meets the needs of each employee's demanding schedule.
- Accelerate the ability to implement change through maintaining a focus on results.

After years of unchecked computer-based e-Learning purchasing and web-based e-Learning development, the company informally examined employee perceptions of such training methods. Most employees saw e-Learning as ineffective, unavailable, unsupported, cost-prohibitive, and too high-tech for the hardware and software that was available at the company's locations. In reaction to these negative perceptions, the company formed an action team, which was comprised of employees who supported the utilization of computer-based training methods. The action team spent three months examining the possibilities of improving the purchase of computer-based e-Learning and the development of web-based e-Learning. By March 2001, the team concluded that the best solution would be to halt the development of web-based e-Learning and only purchase and deploy commercially produced training provided by outside vendors.

Because of this conclusion, the company spent the spring of 2001 evaluating various types of web-based e-Learning and computer-based e-Learning products. After two months of evaluation, the following discoveries and conclusions were reached. First, content providers typically lease or license e-Learning through a per-user or yearly fee, which proved cost prohibitive for the company. Second, content providers tend to distribute basic, generic content so they can in order to maximize their profits offer the content to a variety of businesses, with little or no specific connection to the company's employees. Third, each vendor that was evaluated utilized proprietary technology, which the company saw as limiting in regard to the ways that training could be deployed.

Once again, the company questioned which approach would be best: purchasing or developing e-Learning. In their article "Buy Versus Build: A Battle of Needs (2002)," Laura Francis and Randy Emelo state that the decision to purchase or develop e-Learning "…can be boiled down into three factors to consider: needs, resources, and uniqueness (¶. 1)." To assist in determining the best course of action, the company contacted various distance education professionals. Since much of the company's safety and health training needs were unique and the company had the personnel and the time required to develop e-Learning, the distance education professionals advised that over time, the internal development of web-based e-Learning would be the most effective and economical method of deploying safety and health training within the company. Internally developed content could be modified to meet the needs of the learners at a lower cost than purchasing and modifying computer-based e-Learning or web-based e-Learning through a vendor. Based on this recommendation, the company spent the summer of 2001 developing and demonstrating internally created web-based e-Learning modules designed through the use of various e-Learning development software.

These demonstrations validated the need for further internal development of e-Learning and also raised the following question: how could the company be sure that internally developed web-based e-Learning was educationally effective? To begin answering this question, a pilot study was developed that would provide the company with preliminary results and a method to further investigate the educational effectiveness of internally developed web-based e-Learning.

Initiating the Pilot Study

A total of 18 employees participated in the pilot research projects, which were approved by the Institutional Review Board. These projects were developed to evaluate the educational effectiveness of internally created web-based e-Learning. Each participant received an invitation letter, a consent form, and a welcome letter that were sent via either email or inter-office mail. Throughout these communications, the researchers informed each participant that there were no known risks in participating in the research study and that participation would enable the company to better understand the effectiveness of web-based e-Learning. They were informed that participation in this project would neither require nor provide monetary compensation, and that only data that could not identify any individual or group of individuals would appear in any summary of the data. Each participant was also informed that s/he was under no obligation to participate in the study and that s/he was free to withdraw consent to participate at any time. The researchers concluded these communications by stating that a summary of the results of this project would be supplied to each participant, at no cost, upon request.

Employees confirmed their willingness to participate by signing and returning the consent form. Once the completed consent form was received, the participant was sent a Pre-module Survey. The data gathered via the Pre-module Survey enabled the researchers to gather a baseline of each participant's experience with web-based e-Learning and computer-based e-Learning, prior knowledge of Defensive Driving and Office Ergonomics, and expected learning gained from completing either of the modules. Upon completing and returning the Pre-module Survey, each participant was provided with either the Defensive Driving or Office Ergonomics module.

Web-Based e-Learning Modules

The Defensive Driving and Office Ergonomics e-Learning modules are a combination of behavioral, cognitive, and humanistic learning styles. As shown in Table 1, the Defensive Driving and Office Ergonomics web-based e-Learning modules were developed in accordance to the cognitive levels of Bloom's Taxonomy (Bloom, 1956). The modules also incorporate the descriptions regarding best practice principles. These principles are applicable to the e-learning process, as adapted from the Zemelman, Daniels, and Hyde text book (1998, p. 8).

> **The training is student-centered**. The information in the modules is of interest to the participants from a professional as well as personal viewpoint. Throughout the course, questions will be asked to determine prior knowledge about the subject as well as self-reflection exercises.
>
> **The training is interactive**. Audio, visual, and tactile learning styles will be incorporated.
>
> Although the modules are divided into various sections, these sections are tied to the general theme of each module. The information promotes whole ideas, events, and materials in a purposeful context.
>
> Throughout the training, the learner will be guided to reflect upon his/her experiences so that s/he may evaluate past behaviors. The learner is also encouraged to continually reflect, debrief, and abstract from their experiences concerning any new knowledge of the subject matter as they progress through the content of the module.

Table 1: Analysis of Web-based e-Learning Modules Using Bloom's Taxonomy

Bloom's Taxonomy* Within the e-Learning Modules	
Taxonomy Classification	**Description**
Knowledge	The web-based e-Learning modules provide knowledge about defensive driving and office ergonomics. Pre-assessments, post-assessments, and review questions throughout the training will allow the learner to demonstrate prior and newly gained knowledge.
Comprehension	The information presented is factual, and graphics, tables, clip art, and video support the content that is presented.
Application	The web-based e-Learning modules will engage the learner's prior knowledge through the use of introductory questions about the learner's current practices or behaviors. The main section of each module will then focus on the content and how the learner can change his/her practices or behaviors to apply the content.
Analysis	Each web-based e-Learning module challenges the learner to reflect upon his/her practices or behaviors as well as analyze various examples and respond to questions about these examples.
Synthesis	The "How" and "Why" questions within the modules allow the learner to reconstruct the information in order to develop new knowledge.
Evaluation	The pre-assessment enables the learner to reflect on prior knowledge of the subject. There are questions throughout the training to allow the learner to reflect on what s/he has learned. The post-assessment allows the learner to demonstrate mastery of the content. The post-assessment asks the participant to reflect upon the new information they have just learned. A notable change in behavior and attitude is encouraged in order to promote long-lasting improvements.

*Adapted from: Bloom, B.S. (Ed.) (1956) Taxonomy of educational objectives: The classification of educational goals: Handbook I, cognitive domain. New York ; Toronto: Longmans, Green.

The training is completed individually; however, the company encourages employees to share information learned with fellow co-workers.

The e-Learning module contains a pre-assessment, which is a series of approximately five questions regarding any prior knowledge the student has regarding the content. As the student progresses through the module, new information is presented which builds upon previously learned information. The student retains this information for subsequent use and retrieval throughout the module. The student needs to assimilate the newly learned knowledge and accommodate their activities in their work environment.

The training material is defined but not rigidly presented. The activities within the training allow the learner to review the content and reflect upon his/her practices or behaviors.

Throughout the modules, the learner will have the opportunity to take the new learning and incorporate it into his/her base of prior knowledge. The learner can re-create and build upon the new knowledge they encounter.

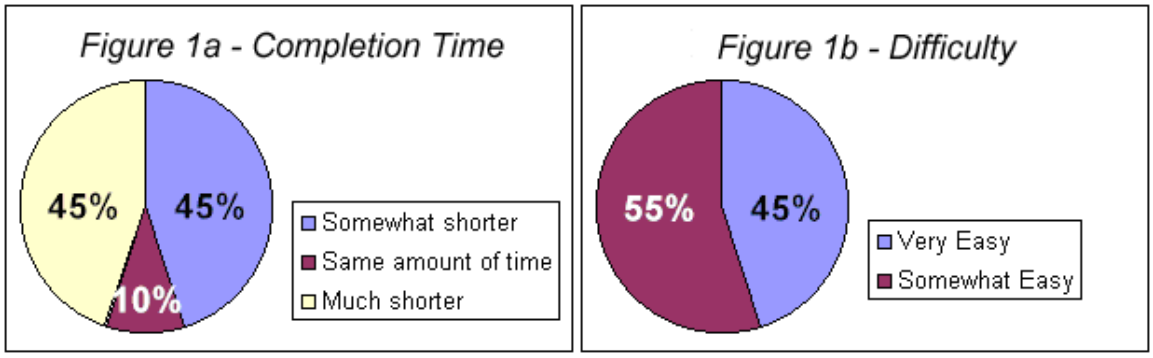
The learner will be challenged as s/he continuously assesses his/her present knowledge about either defensive driving or office ergonomics and his/her need to alter current practices and behaviors in order to maintain a safe and healthy lifestyle.

*Zemelman, S., Daniels, H., Hyde, A. (1998). *Best practice: New standards for teaching and learning in America's schools*. . . Portsmouth, NH: Heinemann.

Upon completion of either the Defensive Driving or Office Ergonomics web-based e-Learning modules, each participant received and completed a Post-module Survey. The Post-module Survey provided participants an opportunity to share what they had learned about either Defensive Driving or Office Ergonomics as well as an opportunity to inform the researchers as to the amount of time it took to complete the web-based e-Learning and how that amount of time compared to previous experiences with training. Once the Pre-module and Post-module surveys were collected, the researchers compiled and analyzed the information. This analysis began by examining basic facts regarding the completion of the modules, and it concluded by examining the learner's prior knowledge, expectations, and actual learning.

Results of the Projects

The data regarding the results of the project were compiled from the information obtained from the Post-module Surveys. As indicated in Figure 1a, it took most participants less than a half hour to complete the training. Figure 1b shows that each learner found the training to be "somewhat" or "very" easy.



Within the Post-module Survey, each participant explained why s/he considered the web-based e-Learning module either "somewhat" or "very" easy. Seventy-eight (78) percent of the participants stated that because they were familiar with the content, the training went quickly and smoothly. Also, the length of the actual training module was a factor, as well as the use of descriptive graphics and clearly written text. The majority of the participants stated that the modules were well organized and easy to navigate. In addition, one participant commented that the interactivity of the web-based e-Learning modules was conducive to holding his/her interest. Eighty-three (83) percent of the participants responded that previous experience with computers made the completion of the web-based e-Learning modules easier. Eighty-three (83) percent of the participants responded that completing previous training through the use of computer-based e-Learning or other web-based e-Learning made the completion of the modules easier.

Simplicity and the length of time it took to complete the training were two factors that were mentioned as positive aspects of the web-based e-Learning. Also, the participants noted that the information contained in the module was pertinent to the subject and effectively increased awareness of the importance of ergonomics in the workplace and safe driving practices.

Sixty-one (61) percent of the participants provided suggestions and comments pertaining to the aesthetics of the training. In one instance, a participant mentioned that the text and graphics made the modules more interesting. However, two of the participants stated the consistency of the text, graphics, and the navigation between the pages of each module should be reconsidered. Several of the participants thought that the assessment questions needed to be more challenging. In addition, it was suggested that more interactivity could possibly better hold the learner's interest and increase the retention of new learning.

Table 2a: KWL Chart for Defensive Driving web-based e-Learning Module

Defensive Driving Module

Know	Want to Know	Learned
• I have taken driver safety classes before.	• I don't believe that I am going to learn anything new	• To keep our wheels straight when stopped and before making a turn. Also, to look left first when at a stop sign
• Somewhat knowledgeable about being aware of road hazards.	• How to react to driving situations.	• That paying attention is a critical behavior necessary for safe driving.
• [I] Have some knowledge of road hazard.	• [Blank]	• Some of the common tasks such as checking the vehicle before driving.
• Just whatever I have gained from years of driving experience.	• Most current and comprehensive information on the subject.	• Several critical factors to be prepared for driving.
• I know to walk around your car to make sure that it doesn't have any flat tires.	• I want to learn the "newest" ideas about being ready to drive.	• I learned that I need to be more aware of my vehicle through regular maintenance, and that I also need to do a much better job using my mirrors.
• I'm familiar with most traffic rules and regulations governing the highway.	• To prepare for bad weather driving conditions.	• When waiting to turn left across traffic to keep front tires straight so to keep your turning options open in case of an accident.
• I know that driving readiness is vital in order to drive safely.	• I want to learn how driving readiness will help me to become a better driver.	• I learned that there are seven critical behaviors that will help reduce or prevent driving accidents.
• Basically what I learned in Drivers' Ed in high school -nothing supplemental.	• How to better anticipate and handle sticky driving situations.	• The 360 Degree Scanning Techniques.

The surveys gathered information about each learner's prior knowledge, expectations, and actual learning. The following questions provided a way to examine these three items:

- What do you already know about this training topic?
- What do want to learn about this training topic?
- What did you learn by completing the training on this topic?

By compiling the Pre-module and Post-module Survey results, a "Know, Want to Know, and Learned" (KWL) (Ogle, 1986) Chart was created.

Table 2b
KWL Chart for Office Ergonomics Web-based e-Learning Module

Office Ergonomics Module		
Know	**Want to Know**	**Learned**
• I have taken Office Ergonomic classes before.	• I don't believe that I am going to learn anything new.	• Review of proper sitting posture at workstation.
• Somewhat knowledgeable about being aware of office hazards.	• How to sit properly at the computer.	• For me, nothing as I have taught this course in detail. I would expect that others would learn quite a bit, however.
• A considerable amount.	• Most current and comprehensive information on the subject.	
• Expert – I have taught the subject in the traditional classroom.	• How to properly lift objects.	• Repetitive motion injury is interesting. I have learned to be more aware of how I sit and position myself in front of the computer.

The above KWL charts show that the participants had prior knowledge of the training, as well as expectations of what new learning the training would present. The chart also shows that learning did occur.

Although the participants expected the basics of both Defensive Driving and Office Ergonomics to be covered in the web-based e-Learning modules, they were curious about each topic and wanted to engage in new learning. To gain a better understanding of how learner expectations were and were not met, the Post-module Survey asked the following questions:

- What things that you expected to learn were covered by this training?
- What things that you expected to learn were not covered by this training?

These questions were compiled to create Table 3a and 3b.

Table 3a
Defensive Driving

Wanted to Learn and was within E-learning Module	Wanted to Learn but was not within the E-learning Module
• Cell phone policy, checking out car, etc. • Normal common sense reactions to driving situations. • Individual awareness and behavior when driving. • Checking car ahead of time. Actual driving. • Things to do before you drive. • Being alert, buckling seatbelts, checking mirrors, checking tire inflation and fluids. • How to reduce and prevent accidents. • No cell phone use.	• Checking out road and weather conditions prior to travel. • Defensive driving practices. • [Blank] • More accident avoidance. • I was surprised that the module did not mention anything about the 2 second following rule. • Night driving and bad weather driving. • I cannot think of anything that was not covered during the module. • None.

Table 3b
Office Ergonomics Module

Wanted to Learn and was within the E-learning Module	Wanted to Learn but was not within the E-learning Module
• Head position; arm position; leg position; back position. • Recognition of stressors. • Proper posture while sitting and computer set-up. • Seat adjustability; seat position relative to the height of the monitor. • Keyboard position; document position; angle position (relative to the seat).	• Proper lifting techniques, (office supplies, luggage, etc.). • More on solutions and controls, specific equipment maybe a link to ergo web page. • Common hazard in office areas (slips, trips and falls. • Types of stretches that would be beneficial to relieve stressors. • Suggestions for eliminating the potential for strain.

The left sides of the above charts show that the participants had some of their expectations met through the training. In contrast, the right sides of the above charts show that the company has an opportunity to improve the training so that it meets additional learner needs.

Cost Savings

The classic evaluation model developed by Donald Kirkpatrick looks at four levels: student reaction, knowledge transfer, behavioral change, and business results (Kirkpatrick, 1975). Critics of the Kirkpatrick model say that it does not take the business impact far enough and that the final step in any training program should be a "fifth level" of evaluation – financial return. This ultimate evaluation determines the financial return on investment (RIO) of the training program. (Kruse, 2002, Art. 5.1, ¶ 1)

The first step in cost-benefit analysis is to measure all direct and indirect costs involved in the design, development, delivery, and maintenance of the program. Because different industries have different ways of doing business, this process called for some careful examination of how the company goes about its daily work activities. If the company more efficiently trains its employees, the time saved can be used for productive work. More work time is then translated into a financial benefit. (Kruse, 2002, Art. 5.2, ¶ 1)

In the article "Is E-Learning Right for Your Organization (2002)," Terri Anderson asks, "Can the company afford an e-Learning initiative?" (Cost, ¶. 1) Demonstration of the potential cost savings, combined with the educational effectiveness of internally created e-Learning, presents a strong business case for utilizing e-Learning. The following is an example of the company's projected cost savings gained by launching one web-based e-Learning module via the intranet. These figures are based on the elimination of redundant tracking systems and the reduction of the use of external content developers and instructors. These numbers represent approximate figures rounded to the nearest thousand dollars, and the figures depict the costs of solely using Instructor-led Training, using a blend of Instructor-led Training and Web-based e-Learning, and solely using e-Learning. Since the company currently utilizes and expects to continue utilizing a blend of Instructor-led Training and Web-based e-Learning, the company expects to achieve the lower end of the potential cost savings. At the time these figures were gathered, savings due to a reduction of travel expenses had not yet been calculated.

Capital Expenditure of 100% Instructor-led Training	$916,000
Capital Expenditure of Training Comprised of 50% Instructor-led Training and 50% Web-based e-Learning	$642,500
Capital Expenditure of 100% Web-based e-Learning	$369,000
Potential Cost Savings Through Utilizing of 50% to 100% web-based e-Learning	$273,500 to $547,000

Conclusion

The Fortune 500 Company saw the utilization of e-Learning as an educationally effective and economical way to deploy training to its locations. Upon developing and deploying two internally developed web-based e-Learning modules, the company wanted to ensure that the training was educationally effective. The company enlisted the assistance of two graduate students from Duquesne University who developed and implemented pilot research projects that would enable the company to better determine the educational effectiveness of its e-Learning.

The pilot research projects each utilized a different web-based e-Learning module, but the Pre-module and Post-module Surveys contained the same questions. Before taking the training, each of the 18 participants completed a Pre-module Survey that provided a baseline of each participant's prior experience with training and training technology as well as prior knowledge of the training content and expected learning gained by completing the training. Upon completion of the training, each participant completed a Post-module Survey. This survey gathered information about the amount of time it took to complete the training and the level of difficulty of completing the training. More important, the Post-module Survey gathered information about what each

participant learned, and what expected information was contained and not contained within the training.

Overall, participants found the training to take less time than other forms of training in which they participated. Participants also found the training to be easier than other training they completed, for these reasons: the training content was familiar and was well-organized, or the participants had previous experience with computers and/or e-Learning. According to survey responses, the participants did gain new knowledge from the training, and gave the company suggestions for improving the training so that it better meets the needs of the employees.

E-Learning is an effective, economical method for providing training to employees. For the training to be successful, the information contained with a web-based e-Learning module needs to be pertinent to the topic, interesting to read, and easy to navigate. In addition, multi-media and interactivity should be included in the e-Learning module, but these items should only enhance the content, not overshadow it. Web-based e-Learning may also reduce resource expenditures by streamlining administrative overhead while simultaneously promoting interactivity between co-workers and providing motivation and teamwork within its workforce. E-learning is a method of training that can enhance the learning process and produce positive results within a company and its employees.

References

Anderson, Terri. (January 2002). "Is e-learning right for your organization?" *Learning Circuits*. http://www.learningcircuits.org/2002/jan2002/anderson.html.

Bloom, B.S. (Ed.) (1956) "Taxonomy of educational objectives: The classification of educational goals": Handbook I, cognitive domain. New York ; Toronto: Longmans, Green. http://www.coun.uvic.ca/learn/program/hndouts/bloom.html.

Douglas, Merrill. (January 2003). "E-volution at corporate u." *e-learning*. http://www.elearningmag.com.

Francis, Laura and Emelo, Randy. (January 2002). "Buy versus build: a battle of needs." *Learning Circuits*. http://www.learningcircuits.org/2002/jan2002/elearn.html.

Kruse, Kevin. (July 2002). "Using the web for learning: advantages and disadvantages." *e-Learning Guru*. http://www.e-learningguru.com/articles/art1_9.htm.

Kruse, Kevin. (September 2002). "Beyond Kirkpatrick: measuring the financial returns of e-learning." *e-Learning Guru*. http://www.e-learningguru.com/articles/art5_1.htm.

Kruse, Kevin. (October 2002). "Measuring the total cost of e-learning." *e-Learning Guru*. http://www.e-learningguru.com/articles/art5_2.htm

Ogle, D. S. (1986). K-W-L group instructional strategy. In A. S. Palincsar, D. S. Ogle, B. F. Jones, & E. G. Carr (Eds.), Teaching reading as thinking (Teleconference Resource Guide, pp. 11-17). Alexandria, VA: Association for Supervision and Curriculum Development. http://www.ncrel.org/sdrs/areas/issues/students/learning/lr2refer.htm.

Zemelman, S., Daniels, H., Hyde, A. (1998). *Best practice: New standards for teaching and learning in America's schools*. Portsmouth, NH: Heinemann. http://www.talpiot.macam.ac.il/hishtalmut/principles.htm.

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Vince Kwisnek is a recent graduate of Duquesne University in Pittsburgh, Pennsylvania, where he earned a Master's Degree in Instructional Technology. He is currently an e-learning developer and co-administrator of a Learning Management System for a Fortune 500 Company. Vince is dedicated to utilizing technology to enable learners to more easily access necessary training and helping others better understand the field of e-learning and how to better assess the effectiveness of e-learning.

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Editor's Note: Distance learning forces teachers to rethink theoretical constructs and teaching practices to optimize performance. Dr. Shih addresses a process to achieve this using the iLearn model.

A Pedagogical Design Strategy for Effective Technology-Based Learning: iLEARN Model

Ju-Ling Shih

Using digital multimedia, people are gaining flexible command of multiple ways to represent knowledge, simulate interactions, and express ideas, extending the reach of intelligence, altering the spectrum of civilized achievement, and lowering thresholds to cultural participation.
(McClintock, 1999, p. 3)

Introduction

iLEARN is an interactive distance learning framework designed specifically for analyzing, understanding, and implementing technology-oriented education but generally applicable to other computer-assisted instruction. It is a pedagogical design strategy which lays great emphasis on learning rather than teaching in the aim of strengthening students' role in the education process. Reminiscent to the Chinese term for "education" which is a compound of two words "teaching" and "learning," this framework created a bilateral dynamic offering a student-centered and teacher-guided paradigm. iLEARN also is the antithesis of the all too common philosophy of "teaching to the test."

It is a challenge for teachers who are used to the conformation of the conventional lectural teaching to adapt to the "invasion" of technology into their classrooms. This paper offers a quick flash of the historical view to the technology-oriented education as a foundation to acknowledge the necessity to create an educational environment supporting effective learning, followed by a thinking strategy for those teachers who are searching for an entrance to the technological realm and a guiding map for pedagogical transformation.

An Historical View

As early as the 19th century, Internet-connected classrooms were visualized. Jean Marc Cote's illustration of 1899 (Figure 1), which was preserved in Isaac Asimov's "Futuredays: A Nineteenth-Century Vision of the Year 2000" (Asimov, 1986), successfully but sarcastically reflected today's education. In the precocious illustration, students sat in line, facing forward much as they do in many of our "modern" public school classrooms, and each student was connected by a local area network to an non-automatic infernal machine.

The teacher, instead of being the only authority in the front of the class and lecturing as the "sage on the stage," was portrayed deciding which books to feed into the machine while a sole "disconnected" student turned the crank to feed the information to the "more worthy" students through the interconnected wires. Textual information was then transferred into electronic form, but mythically "presented" in the absence of its visual form. The transmission of knowledge through the passing of mere information, as if information can adequately be called "knowledge," was mechanical and rigid, and social interaction between each human entity was utterly absent. Inherent in the painting was a view of duplicative education connoting the teacher's and society's message to the pupils: "You will all learn exactly what we want you to learn when we want you

to learn it, and in the manner we have decided is best for you." The painting echoed the spirit of the Industrial Revolution, a mass production and assembly line modality, from which resulted molded instruction.

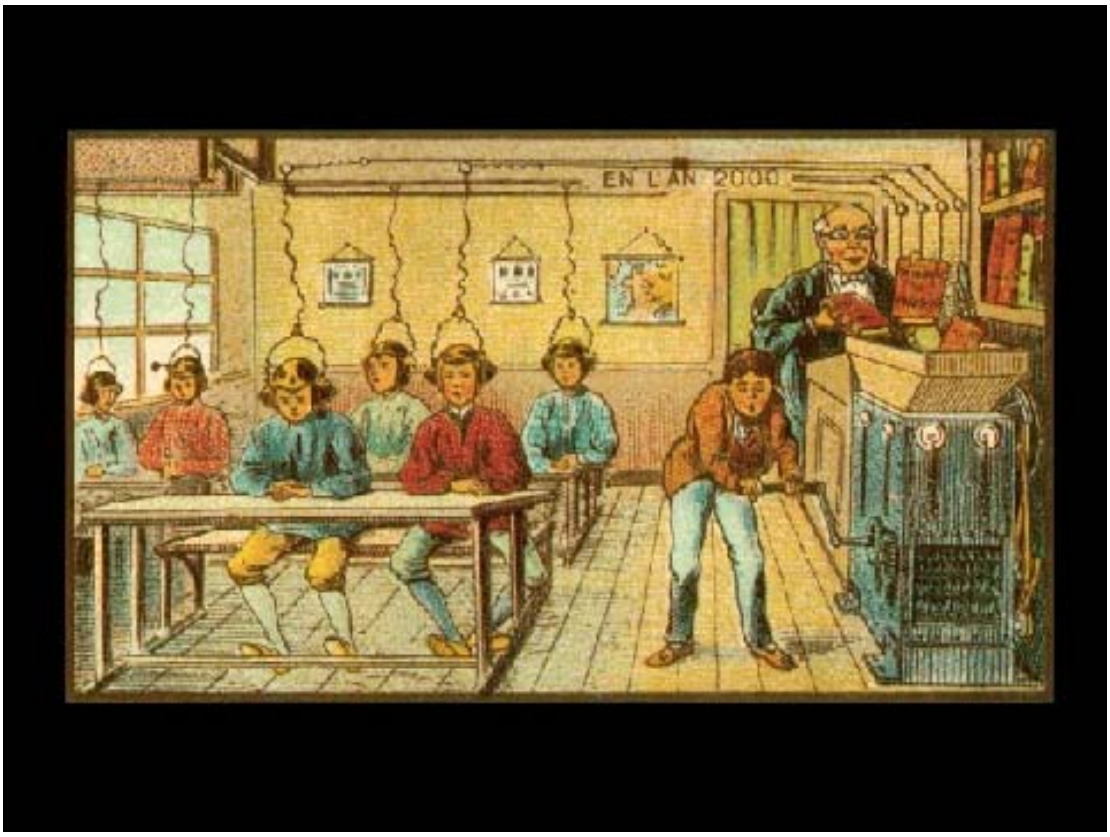

Figure 1: Illustration by Jean Marc Cote
from Futuredays: A Nineteenth- Century Vision of the Year 2000

Molded instruction, which was tightly associated with print-based instruction, was a natural consequence of Johannes Gutenberg's invention of the printing press in 1440 (*Printing: History and Development*, n.d.; Bellis, n.d.). Teachers organized their instruction and course content in a linear fashion to match the sequential and procedural presentation of print materials. All students had identical textbooks and read precisely the same text. The disparity between original and reproduction of a text that often occurred during the transcribing process, when books were written by hand long ago, was thus eliminated. This education system was like a mass production factory in which students were expected to absorb knowledge in its exact original form. Like installing an engine and tires on each empty car, information was loaded into each student's unfilled brain. In the final product test, rather than ensuring that the fully assembled car worked properly, students were tested on their ability to accurately repeat facts on command, proving the information that had been mechanically "installed" in them. Failure to spit out the information absolutely as it had been given to them would cause students to be regarded as products unqualified to be "marketed." Ironically, in the molded instruction, unsatisfactory performance of a product was always a fault to blame on itself; it was seldom aimed at its producer or the process. The student is blamed, not the teacher or the pedagogy. There was a joke, which prevailed in our school office, saying that teaching is to know what to stuff, whom you are stuffing, and then to stuff them nicely. Students' ability to demonstrate subject competency, comprehension, or mastery of the material was somehow ignored.

Adaptation to Change

Yet, stuffing students is not only insufficient but also inappropriate. Congruity, requiring students to have uniform knowledge, is not adequate for a full understanding of any type of subject. One has to be allowed to construct his/her own mental model for knowledge processing and knowledge construction. Due to the increasing latitude and magnitude of knowledge in the digital age, accessing multiple perspectives and multiple interpretations becomes increasingly important.

The concept of accessing multiple perspectives is in consort with pluralism, which is the central idea of postmodernism. “Postmodernism” is a term used across disciplines of philosophy, anthropology, psychology and sociology, referring to a concept that was developed in reaction to modernism's exact science and objective knowledge. Deconstruction and fragmentation ideology has demolished modern absoluteness, and in turn, celebrates postmodern relative-ness. While the pervasion of postmodernism is changing the perception of life in general, it is altering education in particular. Embedded within the concept is the fact that different people learn in very different ways.

Technology, offering its flexibility and fluidity, encourages learners to pace their own learning processes and to pave a way in knowledge construction which best suits them, forsaking the “one size fits all” approach inherent in traditional education.

Constructivism, as a teaching and learning paradigm in the postmodern world, suggests a context-dependent learning based on the belief that knowledge comes from experience and is dynamic. Its pluralistic point of view encourages individual thinking and meaning making, each being a consequence of the learner's internal negotiation among various perspectives that are stimulated from the external world.

It is often misinterpreted as a laissez-faire policy, which denotes “learning whatever you want in whichever way you like.” Actually, an open approach in education requires a proper amount of scaffolding, building on solid knowledge foundation, which is especially important for learners new to the discipline. Intellectual and spiritual supports normally come from the teacher who pays continual attention to the students' learning process, and provides appropriate guidance to satisfy individual learning needs. With the assistance of technology, distance education can extend the virtues and minimize the defects of traditional “slate-and-notebook” classroom practices.

Theoretically and pedagogically, constructivism can be applicable to subjects in different domains. Subjects that require creative thinking, such as liberal arts, or subjects that require systematic scientific experiments, are all suitable for constructivist education. Even in technical and medical schools, students can benefit from field learning, case studies, and mentor systems, in which they are placed in a real-world context rather than a situation supposed in the textbook, so that students acquire necessary skills spontaneously with professional assistance at the side instead of vicariously imagining the scene by reading the textbook. Consequently, in the postmodern education, “learn by doing” becomes one of the pedagogical principles in liberating both teachers and students from the rigid model of education.

In technology-driven online courses, which depend heavily on the advancement of the technology, instructors often had to make compromises to the limitation of technological availability and accessibility. This framework emphasizes the inter-personal communications, both online and in-person, and provides an effective knowledge transfer environment model with the premise that technology is merely used as a tool rather than serving as the driving force.

Framework of iLEARN Model

The iLEARN model is fundamentally based on the theory of constructivism, which incorporates various elements extracted from major instructional design and learning theories. It is a framework expected to stimulate critical thinking on strategies for pedagogical design. The basic concept of this framework is derived from David Perkins's five facets of technology-based settings, namely information banks, symbol pads, construction kits, phenomenaria, and task managers (Wilson, 1996), each is categorical in the iLEARN model. His "person-plus" has been widely used to make the indivisible links between the learner and the environment; nevertheless, the implication of "person-plus" in the iLEARN model is extended to include activities, resources, artifacts, human networks, symbolic media, and pedagogical support surrounding the learner.

A prime belief used in the design was that an effective education takes place in a self-motivated situation where the environment is not only rich with organized and retrievable resources built with clear teacher guidance, but also is constructed on an amiable network where a three-way interaction between the teacher, students, and external resources takes place.

What the iLEARN model entails is not a set of procedural guidelines; the elements within the model are inter-connected with each other in no specific order (Figure 2). The framework is meant to be applied in a manner corresponding to the designated situation. It is dynamic and fluid.

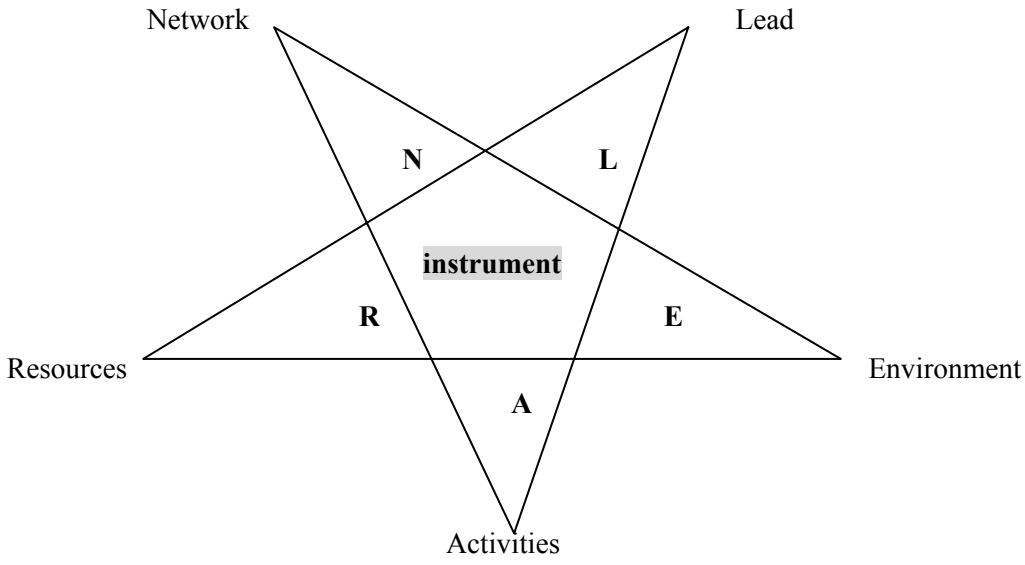

Figure 2: iLEARN Model, The Six Elements: instrument, Lead, Environment, Activities, Resources, and Network.

The first element of the iLEARN model, instrument, is located in the center of the asterisk to represent the foundation of the framework. The other five major elements, namely learning environment, activities, resources, network and teacher's guidance, are incorporated and established around and within the asterisk tightly connected with and based on the first element, instrument. An online course construction could start with any of the elements. In the diagram, one element is led to another and consequently will return to the starting point after all five of them are visited. Each element has a definition as follows:

i: instrument. This element is about the role, the design, and the use of technology in an online course, for it is the instrument for online education. Technology can be any civilized invention, including table, chair, paper, pen, even computer and the Internet. “i” is specifically used in lower case to signify its least important role in this framework. In a technology-driven environment, teachers always have to surrender to the fast-paced technological development. Most frustration felt by such teachers came from experiencing confinement due to their frequent inaccessibility to technology or their insufficient capability to catch up with the state-of-the-art.

The iLEARN framework, on the other hand, is technology-centered rather than technology-driven. Without over emphasizing the role of technology, the Internet and computers are stressed only to the degree that they function simply as environment enablers. The real actors on the stage are the teachers and students, not the technology. However, the unavoidable high reliance on the technology could upset a learning experience when it loses its regular functions, and when it is “down.” The emotional frustration attached to the technology's functional failure sometimes appears to be more thought-provoking and exasperating than the corresponding situations in the conventional learning environment such as temporary campus disruptions resulting from catastrophe or construction, or the instructor's absence from the class for personal health concerns. The probable reason could be the desperate situation the users were in when the absence of an element was irreplaceable immediately. Therefore, it is supposed that the distress caused by technological failure can be substituted and transferred from machine to people.

Besides the technological hardware construction, interface design is also a key issue since a course web site's usability relies heavily on the interface's user friendliness which will consequently influence the learning outcome.

Other than personal computers, instruments for the online education include the Internet, courseware, equipment, and communication tools such as chat room, discussion board, and net meetings. While many teachers think E-Mails and search engines are for casual interaction with friends, novel use of these tools can greatly suffice educational purposes. Instead of being confined by the limited functionalities of the instruments, teachers can focus on the tools' strengths and create opportunities to make the best use of them.

The use of multiple modes of representation is also encouraged (Hobebein, 1996). Another advantage of online education is that technology provides the opportunity of knowledge presentation in diverse media formats, including textual, audio and visual representations, which is generally called “multimedia.”

L: Lead. Lead is about the important role of the teacher in online courses. Although many people may interpret that constructivism contributed to the freedom of the students’ learning and their knowledge construction so they learn what they want freely and automatically, I would argue for the contrary. A huge amount of behind-the-scene instructional design involving the preparation of various teaching approaches is needed to accommodate students' different needs and learning styles. Although it often appears to be a non-planned opportunistic teaching style, actually, that often is not the case. This recognition of the need for careful planning reflects on Wilson's contention that students who are given generous access to information resources and tools are likely to learn something if they are also given proper support and guidance and that “the complex nature of learning environment interactions is no excuse for careful planning and design to the extent possible” (Wilson, 1996, p. 5).

This emphasis reinforces the teacher's role in distance education, which is often ignored in the interpretations of constructivism. To sustain this element, the teacher has to take seriously his/her responsibility to navigate students through the learning process.

E: Environment. Environment refers to the setting, pace, tone, and culture of a course. Some people jokingly say the convenience and freedom of distance education is that the students could take their courses with their pajamas on, with the television on or music playing, with their feet up on a table or desk, with a laptop on a breakfast tray in the comfort of their own beds, or even when they are in the bathroom; not surprisingly, these statements are all true since online education is different from the traditional learning environment of here and now; it is anytime anywhere. Distance education can permit the learning environment to be completely tailored to one's needs in a way that could not be done in conventional classroom learning. The distance education classes no longer take place within the 50-minute time constraints, and have overcome the space limitation of the four walls of the classroom. Therefore, students can conduct self-paced learning in their own time, and can access their education from everywhere in the world.

The ideal online learning environment is one where the teacher can facilitate an amiable learning space, since face-to-face communication has been precluded. It is also generally understood that humans' ability and involvement toward work of any kind is strongly attached to their emotions. Whether or not a course is established with a friendly and personalized atmosphere is important because students' familiarity toward the surroundings will affect their learning outcome.

How could this be achieved in an online environment? Without seeing each other face-to-face, the instructor's tone of written instructions is the key. Many symbols that are created for online communication are not only literary but also behavioral. By becoming familiar with this new language, the instructor could be in step with technological fashion, yet communicate with students who seem to be a generation apart. For example, symbols and expression icons are incorporated in many Internet communication tools. With symbols, which are often called "smileys," such as ☺ or ☹, personal emotions can be presented in the textual form. Learning could be more humanized, personalized, and entertaining than formal lectures and assignments.

A: Activities. One similarity between situated learning, anchored instruction, and goal-based scenario theoretical frameworks is that they are all dedicated to learning in situations. "It is an argument that the relationship between mind and environment is so complex, and so interdependent, that it is an oversimplification to consider them separately" (Greeno, 1997). Therefore, the iLEARN model also advocates the idea of positioning the students in the real-world representational network where they can experience the technical aspect of the work as well as the social interactions between people that normally influence the working process a great deal. One criterion described in Rich Environments for Active Learning (REALs) is to "utilize participation in dynamic activities that promote high level thinking processes, including problem solving, experimentation, creativity, discussion, and examination of topics from multiple perspectives" (Dunlap, 1996, p. 66).

Activities can be in various forms, namely project production, regular assignments, group work, research, and/or presentation. In whichever form they are, the key is to create a problem space where students can witness the state change of a problem from its initial stage to its goal stage. Through a maze of states, the problem solver needs to search for an appropriate path for the solution to a problem, which is achieved through a search process (Anderson, 1980). The conscious experience of the problem's transformation from problem to solution is the thinking process of learning.

The ultimate goal of these activities in distance education is to help students to successfully transfer knowledge from the classroom to the real world by increasing their personal experience in the process of information transmission.

R: Resources. Another criterion of REALs is its goal to "promote study and investigation within meaningful and information-rich contexts" (Dunlap, 1996, p. 66). Teaching a course online does not mean that the teachers are off duty once they post the syllabi online. Specially selected,

organized and presented materials such as resource database banks, are essential, especially for higher education. They are not meant to confine students within the pre-defined context, but rather to provide professionally chosen useful resources to initiate students' learning. It is the teacher's responsibility to ensure that the information library is not limited to the "volumes" it starts with, but that it can grow during the course in accordance with students' expressed needs for additional or special material, with students themselves perhaps being agile enough at navigating the Web to find these resources and make them available to other students through the teacher. These resources are likened to textbooks in the traditional classroom because they carry the designated job to direct the students' paths for learning.

Resources that are provided should thus have the potential for being usable in making inferences. The teacher should be sufficiently aware to not "dead-end" the resources, but rather to provide significant implications of how they are used and where they are likely to lead. Instead of treating the resources as exam content, the resources should be applicable to various activities so the functionality of the resources can be brought out. While one goal of the course is to adequately cover the material listed in the syllabus, a larger goal is to get the students to "think outside of the envelope" and go beyond a somewhat narrowly defined syllabus to discover how a piece of material fits into the larger picture of themselves and an ever-changing, somewhat amorphous world.

N: Networks. "Human activity is socially bound and not simply the sum of individual actions" (Engestrom, 1990). Learning is likewise. "In an effective learning environment, an individual's tool-using and information-using activities need to be complemented by the powerful resources presented by other people and by the surrounding culture" (Wilson, 1996, p.5). This suggests the importance of situating learning in the social context and establishing human linkages within the social network.

Many scholars and theorists have discussed the functions of cooperation and collaboration. In REALs, one criterion is to "encourage student responsibility and decision making and intentional learning in an atmosphere of collaboration among students and instructors" (Dunlap, 1996, p. 66). The central idea is to facilitate a collaborative network within which interactions among the teacher, students and/or with external experts, could take place.

The advantage of collaboration is that while the individual and one or more people jointly engage in the same activity, they also share cognitive labor. In Salomon's term, it is a process to yield "cognitive residues," (Salomon, 1993, as cited in Hewitt, 1996, par. 5) a cognitive "effect of" computer supported collaborative learning.

Collaboration process also assists to foster multiple perspectives and multiple interpretations toward any given context. Toward that end, I propose an interactive network that includes not only peers but also external resources, namely professional practitioners, who can demonstrate expertise on issues and provide real-work perspectives, or parents who can consult on building social relationships. It is akin to establishing apprenticeships between experts and amateurs where students could get consultation and support, and technology can be the means for students in distance education to build social networks. "The Internet for them has become a necessary social tool" (LaQuey, 1994, p. 11).

Pedagogical Strategies

Having a map is not enough to tour around a place; directions need to be given in order to find the destination. Once the network is built, the interaction has to be initiated. A framework shell does not function until the guidelines are taken for actions. In an online learning environment, the

teacher and students both have their portions of work to ensure successful teaching and learning; each has his or her own new responsibilities.

A teacher's duties and obligations include liberation, affiliation, and navigation, which are at many times reminiscent of those a parent must skillfully assume (Figure 3).

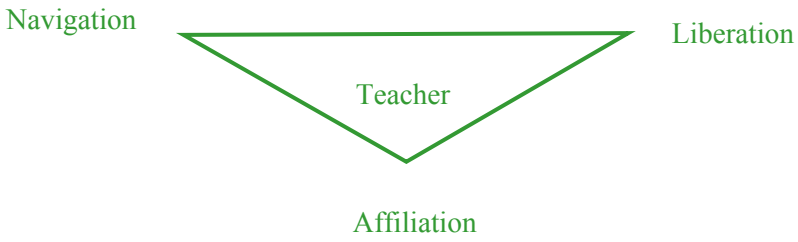

Figure 3: iLEARN Model, Guideline For Teachers: A Conceptual Adjustment to Facilitate Liberation, Affiliation, and Navigation.

Liberation. A successful movement from the traditional education environment to one that is technology-supported requires the teacher to open up the space for various and multiple learning styles, schedules, perspectives, and interpretations. The goal is to achieve "emancipatory education." The need is to construct a heterogeneous education environment, which fosters independent thinking and individualized learning. Technology could both liberate and limit learning; it all depends on how the teacher uses it. If teachers can successfully shift their teaching beliefs and methodologies to distance education, the students could benefit more likewise.

Affiliation. The second responsibility of the teacher is affiliation, to strengthen the importance of companionship. While students are given freedom of learning with their own goals, at their own pace, they are not to be encouraged or permitted to aimlessly wander around. This results is a difficult distinction to define the line between these states. It varies by student and by time, and requires patience and astuteness from the teacher lest unnecessary intervention occurs that stilts curiosity. Teachers should try their best to establish both technical and emotional associations with the students, being a friend where necessary but not losing the important ability to step into the role likened to the combination of co-pilot and guiding parent when needed.

Navigation. On top of providing companionship to students, the teacher has to scaffold students' learning by providing guidance. Based on the constructivist view of knowledge, which is constructed rather than obtained, the teacher should shift his/her role from being the only authoritative figure in the class to being a mentor or a counselor. One of the criteria for best learning is for the teacher to "provide experience with the knowledge construction process" (Hobebein, 1996, p. 11).

Students' parallel responsibilities toward effective learning include interaction, experience, and research (Figure 4).

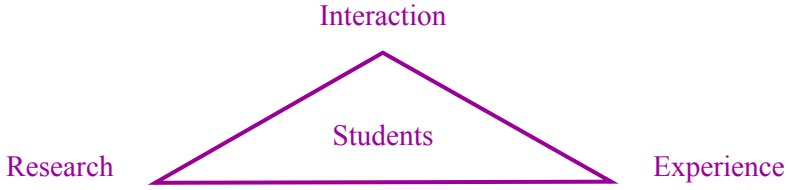

Figure 4: iLEARN Model, Guideline For Students: A Conceptual Adjustment to the Motivation and Practice on Interaction, Experience, and Research.

Interaction. Students are given the opportunity to collaborate and cooperate with other classmates to accomplish tasks by sharing their work, exactly as most real world projects occur. "Provide experience in and appreciation for multiple perspectives" is especially important to enhance effective learning as well as to "embed learning in social experience" (Hobebein, 1996, p. 12). Other scholars and theorists also advocate the same concept.

Constructivists argue that cooperative learning and cooperative problem solving groups facilitate generative learning. Working in peer groups helps students refine their knowledge through argumentation, structured controversy, and reciprocal teaching. (Dunlap, 1996, p. 68)

Experience. Students are provided with an environment in which they are situated in the real-work context to gain hands-on learning experience. Theoretically, it not only increases students' learning motivation and provides opportunities to make inferences from the course work to real-life situations, it also enhances memory and skill transfer and prepares students for real-world tasks. It embeds "learning in realistic and relevant contexts" (Hobebein, 1996, p. 11), and it reflects the anchored instruction, which is purported to put students in "a realistic context that is appealing and meaningful to students" (Dunlap, 1996, p. 67).

Research. Students not only have to participate in the activities, but also have the responsibility to look for information that goes beyond the given. They have to relate their personal experience to the resources and extend that to external information. They are encouraged to take "ownership and voice in the learning process" (Hobebein, 1996, p.12), and to "take action to create meaning from what they are studying" (Dunlap, 1996, p. 67) so they can generate usable knowledge from learning context. Research, and the role of computers in removing barriers to it, is one of the chief ways education can be turned from the often passive experience to an active one that is predicted as a byproduct of distance education.

Relationship Between Guidelines The teacher and the students have to strive to fulfill their responsibilities together to achieve a successful education. A good education requires both parties to participate in the action, hand-in-hand. When the teacher and the students' roles meet each other, it is as if the two diagrams are put together; it becomes an asterisk or star, as shown in the diagram (Figure 5). It is neither a teacher-centered model nor a student-centered model. There is a mutual dependence where the ideal education occurs.

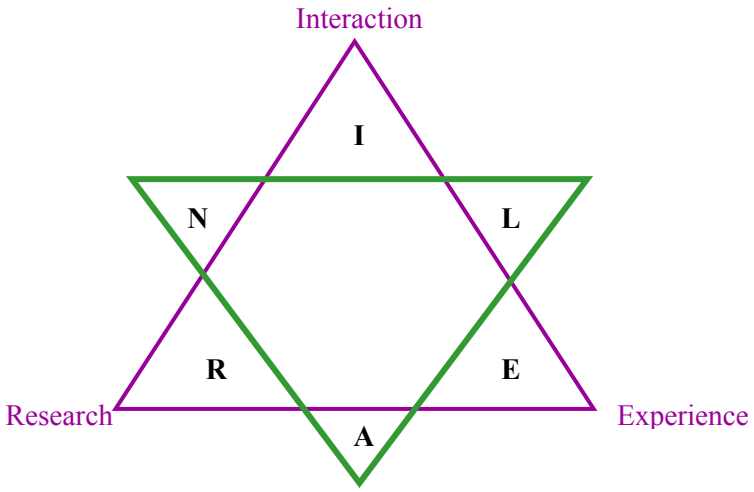

Figure 5: iLEARN Model, Relationship between Teacher and Student Guidelines

It is an inherent belief of the iLEARN model that when both the teacher and students collaborate in the education process, the interactive learning environment is thus enhanced. The overlapping space in the diagram is the representational network where the interactive learning environment is located. To illustrate the application of this design framework, all guidelines are interrelated with the elements of the iLEARN model.

Conclusion

The education paradigm shifts when a course is moving online. It is a challenge for the teachers to rethink the methods and techniques they use in the classrooms. With ample consideration of the opportunities and barriers of developing a learning environment online, teachers can successfully achieve the ultimate educational goals of enhancing the quality of the students' learning.

Constructing learning space is like architecture. Building knowledge foundation, networking for energy and motivation, facilitating designs according to educational landscapes, selecting the best quality materials, drawing blueprints of guidelines, extending the use of space with a pedagogical scaffolding process, and applying the art of design are what the successful education architect must be prepared to do. This is exemplified by the modern architect Frank Gehry, who employs space in an inconceivable way to its greatest extension in his architecture, in that constructivism in distance education constitutes the same incarnation of pedagogical theories. Teachers are encouraged to transgress conservatism for students to construct a customized learning space to its highest possible limit.

Technology is a new medium for education, and distance education is an evolutionary field with generous possibilities. Significant differences can be made for courses with different objectives and cultures, and yet they can still generate significant positive results. Like home schooling, distance education is not meant to replace classroom-based education. It is an alternative, for all schools, teachers, and students. Educational institutions should make no judgment of whether distance education is inferior or superior to conventional education, but instead should regard it as a different medium of education. It is a matter of choice, on deciding which one to use and then how to best use that educational medium to achieve the desired goals; and we are trying to make it do just that, as well as is possible.

References

Anderson, John R. (1980). *Cognitive Psychology and Its Implications*. San Francisco: W. H. Freeman.

Asimov, Isaac. (1986). *Futuredays: A Nineteenth-Century Vision of the Year 2000*. NY: Henry Holt.

Dunlap, Joanna C., & Grabinger, R. Scott. (1996). Rich Environments for Active Learning in the Higher Education Classroom. In B. Wilson (Ed.), *Constructivist Learning Environments: Case Studies in Instructional Design*. NJ: Educational Technology Publications, Inc.

Engestrom, Yrjo. (1990). *Learning, Working and Imagining: Twelve Studies in Activity Theory*. Helsinki: Orienta-Konsultit Oy.

Greeno, J. G. (1997). On Claims that Answer the Wrong Questions. *Educational Researcher, 29 (1)*, 5-17.

Hewitt, Jim, & Scardamalia, Marlene. (1996, April). *Design Principles for the Support of Distributed Processes*. Paper presented at the American Educational Research Association, New York.

Hobebein, Peter C. (1996). Seven Goals for the Design of Constructivist Learning Environments. In B. Wilson (Ed.), *Constructivist Learning Environments: Case Studies in Instructional Design*. NJ: Educational Technology Publications, Inc.

LaQuey, Tracy L. (1994). *The Internet Companion : a Beginner's Guide to Global Networking* (2nd ed.). Reading, MA: Addison-Wesley Pub. Co.

McClintock, Robert O. (1999). *The Educators Manifesto: Renewing the Progressive Bond with Posterity through the Social Construction of Digital Learning Communities*. Unpublished manuscript, New York.

Printing: History and Development(n.d.). Jones Telecommunications & Multimedia Encyclopedia. Available: http://www.digitalcentury.com/encyclo/update/print.html [2002, April 10].

Wilson, Brent G. (1996). Introduction: What Is a Constructivist Learning Environment? In B. G. Wilson (Ed.), *Constructivist Learning Environments: Case Studies in Instructional Design* (pp. 3-8). NJ: Educational Technology Publications, Inc.

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