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ABSTRACT

Trends in pedagogy and in technology are converging to make distance learning environments of the 21st century. Trends in pedagogy have encouraged the movement away from the learner as a passive recipient of information and toward a more active model of learning. Earlier generations of distance learning media and methods were ill-suited to the active learning model. More recent technologies of distance learning, most notably computers, the Internet, and interactive video, have the potential to support the new model of learning. This paper describes different strategies to integrate activities to support this new model of learning into courses in distance learning programs at DePaul University (Illinois) and Mercy College (New York). An integral component of higher education in the new millennium will be collaborative learning, not only because it supports active learning, but also because it is required for the workplace for which students are being prepared. Moreover, as more corporations become global, collaboration will be mediated by technology. This paper also discusses ongoing research being conducted to measure the effectiveness of technology-mediated collaborative learning. A questionnaire for a student survey on distance education and collaborative learning is appended. (Author/AEF)

Using Collaboration in Support of Distance Learning

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Abstract: Trends in pedagogy and in technology are converging to make distance learning environments of the twenty-first century meet the needs of the learner of the 21st century. Trends in pedagogy have encouraged the movement away from the learner as a passive recipient of information and toward a more active model of learning. Earlier generations of distance learning media and methods were ill-suited to the active learning model. More recent technologies of distance learning, most notably computers, the Internet, and interactive video, have the potential to support the new model of learning. This paper describes different strategies to integrate activities to support this new model of learning into courses in two distance learning programs. An integral component of higher education in the new millennium will be collaborative learning, not only because it supports active learning, but also, because it is required for the workplace for which we prepare our students. Moreover, as more corporations become global, collaboration will be mediated by technology. The paper also discusses ongoing research being conducting to measure the effectiveness of technology-mediated collaborative learning.

Collaboration will be the hub in the wheel of pedagogical strategies necessary for success in the new millennium. The 21st century will see a great expansion in the use of distance learning in the education environment. The teacher-student relationship is increasingly mediated by the use of technology. No where is this more evident that in distance learning. The typical distance learner is a mature person with a substantial number of commitments in addition to furthering his/her education. This paper investigates the implications of the reliance upon technology by distance learning programs. It addresses such questions as, what pedagogical shifts teachers should make to achieve effective learning outcomes and what changes institutions need to make to support the distance learner in order for this type of program to succeed. The authors report on findings derived from their joint research, from current literature, and from the practice of teaching in and supporting distance learning programs at their institutions.

The initial driving force behind distance learning programs was the desire to provide opportunities for learning to individuals who are not able to attend an educational institution, to increase the number of educational experiences available to individuals, and to provide educational opportunities to individuals at times and places of their convenience. This third reason for distance learning programs has taken on increased importance in proportion to the number of working adults seeking higher education. The early modes and media of distance education met these needs by providing educational opportunities for students who did not reside nor commute to campus. [Edelson 97]. These modes and media included correspondence courses, courses on audio and video tapes, and courses broadcast via satellite and cable television. Distance learning programs employing these media can successfully deliver the educational programs based on the lecture-text-exam model of education to the distant student. According to this model of education, the two primary activities that produce successful learning are attending lectures delivered by content experts and reading texts written by content experts. Evaluation is accomplished by examination. In this model the learner is the passive recipient of information absorbed through listening, seeing, and reading.

Shifts in learning theory, especially in adult learning theory, challenge the lecture-text-exam model of learning [Knowles 84]. They indicate that learning is achieved when the learner is actively engaged in the creation

of knowledge rather than the passive recipient of information [Bruner 73, Brooks & Brooks 93]. According to many learning theorists this creation of knowledge is social and it arises out of conflicts between the learner's prior knowledge and new observations [Brooks & Brooks 93]. In this model, learning is achieved within an environment that fosters interactions between learners and instructors, between learners and other content experts, of learners with a rich set of content resources, and among the learners themselves. This learning environment should support the learner's active questioning of instructors and content experts as much as receiving information from them. It should support the learner's active exploration and manipulation of content materials as well as reading texts. The environment should support collaboration among learners and opportunities for peer review of learners' work [Ben-Jacob & Levin 98a]. This active learning model contrasts sharply with the passive, lecture-text-exam model. The active model is learner-centered, the learner's questions drive the creation of knowledge. The passive model is teacher-centered, the teacher's knowledge is what must be transmitted to the learner. The shift from the passive to the active model of learning is accompanied by a shift in emphasis from evaluation of what the student has learned toward assessment of student learning. Evaluation is a summative exercise concerned with whether the student has absorbed and integrated the teacher's knowledge. Assessment is ongoing and integrated into the learning experience.

The shift from the passive to the active model of learning requires a concomitant shift in the roles of learners and instructors [Barr & Taggart 95]. Learners need to assume a far greater responsibility for their learning. Besides choosing what and when to learn, they must become active questioners and investigators. The role of the instructor shifts from disseminator of information to facilitator of learning.

The earlier media of distance learning are not well suited to the active model of learning and its new roles for learners and instructors. However, recent developments in instructional technology have led to new trends in distance learning that are better suited to the active model of learning, provided their use is accompanied by appropriate shifts in teaching strategies. Technology, academic research and pedagogical innovation on one side, balanced with the increase in the maturity level, chronological age and personal commitments of the college or university student of today on the other side have encouraged the popularity of a redesign of the structure of the learning environment for higher education. Demographics, geography, and the desire to further one's education has, along with the aforementioned factors, made distance learning networks or asynchronous learning networks blossom into a viable mode of learning [Ben-Jacob & Tucciarone 97]. It is, however, true that distance learning networks mean different things to different institutions. The fundamental medium can be videotapes, videoconferences, audio-conferences, online tools, or any combination.

In the remainder of this paper we (1) describe the institutional contexts of distance learning programs in which we teach; (2) briefly describe the design of courses we teach within these programs, including a discussion the pedagogical shifts necessary to the achievement of successful learning outcomes in distance learning environments; and (3) report on the authors' research to measure the effectiveness of technology mediated collaborative learning activities of our distance learners.

The Institutional Contexts

Mercy College is a comprehensive college in the New York metropolitan area offering undergraduate and graduate degrees. The college is an independent, four-year institution that serves some 7,000 students, both traditional and non-traditional, on several campuses and learning centers. The students vary in age, race, cultural heritage, and native language. Approximately 27% of the students are of Hispanic descent, while 21% are African-American, and 3.5% are Asian/Pacific Islander. Students come from 79 countries and speak more than 30 native languages. It is a college that is committed to the advancement of technology in education as can be evidenced by activities that deal with the infusion of technology throughout the curriculum.

In particular, Mercy College supports MerLIN, an online educational system which offers a range of online courses from sundry disciplines ranging from mathematics and the sciences, to psychology, business and the humanities. Quite recently, the College has had three online bachelors degree programs approved - computer science, business, and psychology.

MerLIN, Mercy College Long-distance Instructional Network has its courses' underlying framework as forums. For each forum, the professor can post public messages arranged in threads of conversation that include discussion of topics, homework assignments, answers to questions posed, etc. Private discussion between lecturer and student or students can take place via e-mail. Additional features of the system include teleconferencing for live

typing sessions, including online office hours between professor and students, and file libraries, which are documents for users to read online or copy to their computers.

DePaul University is the second largest Catholic university in the United States, enrolling 17,800 students in 130 undergraduate and graduate programs. Like Mercy College, DePaul is an urban university with five campuses in the Chicago metropolitan area. DePaul prides itself on serving a diverse student body; having been cited by *Time* and *The Princeton Review* as one of the top seven school in "The Best College for You" for its success in recruiting a diverse student body. Ten percent of its student body is African-American; 9% is Hispanic; and 8% is Asian-Pacific. Over half of DePaul's student body is non-traditional in that they are over 25 and/or work full-time while attending university. DePaul University has a history of developing innovative programs in higher education and attempts to continue this tradition of innovation in its use of technology in teaching and learning, especially its distance learning programs.

Many of DePaul's academic programs are committed to fully integrating the use of technology into the students' learning experiences. Computers and the Internet are used extensively to provide students with online academic resources; the ability to communicate with instructors, peers, and "visiting" content experts through the use of e-mail, listservs, electronic discussion groups, and chat rooms; and a full set of online student support services. Among its distance learning initiatives DePaul makes use of interactive video through a network of interactive video rooms on four of its campuses. Many of DePaul's interactive video courses make extensive use of computers and the Internet to supplement the classroom experience with content web pages and links, e-mail, online discussion groups, chat rooms, and multimedia materials and applications, as well as customized tools developed in house to support online learning.

Making the Pedagogical Shift

The new technologies for distance learning described here, interactive video, computers and the Internet, have the potential to provide a learning environment that can support active learning, but only if they are married to important shifts in teaching styles, content delivery, and learning activities. Without these changes interactive video courses simply allow instructors to lecture to multiple sites simultaneously and Internet courses are just correspondence courses by e-mail.

At Mercy College, Ben-Jacob teaches Discrete Mathematics using the MerLIN system. E-mail is used for individual communication between students and the instructor. Discussions of how to solve problems, problem sets, partial solutions, and final solutions are posted in forums. For some problem sets, students are encouraged to post partial solutions to the forum for comment and review by their peers. This results in students learning multiple approaches to solving problems and in learning by teaching. Each major topic is introduced with a question that can be answered by the students without specific prior knowledge of the subject matter. Ben-Jacob has taught this particular course before both online and in the traditional classroom setting. In the past, in the traditional classroom, she has always been able to cajole the reluctant student to express at least an opinion with regard to the classwork; online, however, if a student is reluctant to post an opinion and chooses not to respond to the forum posting, it has proven difficult to get him/her to participate. Most of the students in this situation have admitted their reluctance stems from the fact they are not sure their responses would be correct. To overcome this, the initial common sense or "thought" question is posed. As a prime example, prior to introducing the subject of logic, the students are asked to discuss the differences and similarities between three very short logical arguments. Two of the arguments are logically equivalent but do not use any of the same words in their propositions. The third argument, which is different logically from both of the others, uses the same words that appear in one of the former arguments. The students are advised they do not need to read the text to respond; they are to use their intuition, and that we are looking for their opinions, not "right" or "wrong" answers. Another pedagogical tactic employed in the online course is that of posting a request for peer help with a problem before Ben-Jacob solves it. Discussion questions are well suited to a distance learning course. Ben-Jacob has found that the more technical the online course is, the more reluctance there has been on the parts of the students to engage in online exchanges, and the greater the need for her to facilitate the beginning of the discussions.

At DePaul University, Levin teaches Ethical and Social Issues in Computing. This course is taught at two of DePaul's campuses using interactive video and makes extensive use of the Internet. In order to make the classroom discussions interactive each class period has at least one planned student delivered program from each of the two class sites. This may be a summary of an article, a presentation of individual or group work, or a debate of

an ethical issue with the proponents at different sites. The course has a web site that contains links to many content resources that have been identified and annotated by students as well as the instructor. The course uses HyperNews, an asynchronous computer conferencing system, for required online discussions. We have two types of discussions: topics discussions and discussions of readings. Over the course of a quarter each student is required to summarize one reading assignment in the readings discussion group. Students are encouraged to post "I don't understand why the author says this" messages in this discussion. While students, especially the summarizer, are encouraged (awarded extra credit points) for posting good answers to these questions, the instructor usually answers these questions. Nevertheless, by using this time and space for initial discussion of the readings, students come to class well prepared.

The instructor posts opening questions in the topic discussions. These questions typically encourage students to take a position on an issue. In the course of the quarter each student is required to post a minimum of five initial responses to a topic question and respond to at least one topic thread (discussion initiated from an initial response) each week. A new topic discussion is started each week and lasts two weeks. After the first two weeks, the instructor does not directly participate in the topic discussion beyond posting the initial question. Instead suggestions, feedback, encouragement, and assessment are provided to authors directly by e-mail. This allows the students to take full ownership of the discussion. With a few minor exceptions students contribute far more than the minimum to these discussions.

In order to provide meaningful experiences in distance learning environments we believe instructors should act as models and facilitators. The distance learning environments, whether the Internet or interactive video, may not be a forums in which the student feels comfortable conducting an intellectual conversation or doing work. It is important that show the students how to do this. However, it is equally important that the instructor knows when, after modeling the behavior, to "step aside," allow the students to take ownership of the conversation, and assume the role of facilitator. We would like to model each course beginning with the professor acting as the hub of a wheel composed of students as the spokes. As the course progresses, the professor should remove him/herself from the center of the wheel and serve in a consultative or facilitator capacity to stimulate dialogue and to pose questions (Ben-Jacob & Tucciarone, 1997).

In general, of course, students need a clear understanding of what is expected of them and the objectives and outcomes of each activity. These needs are heightened in the distance learning context where nonverbal means of communicating uncertainty or discomfort are not possible.

Current Research: Using the Internet to Support Collaborative Learning

Learning activities that encourage collaboration are particularly important for students of the twenty-first century. The student of the twenty-first century will be a lifelong learner. The sharp delineator between school and work will fade. In the work environment collaboration with one's fellow workers is essential for success. We believe that it is equally essential that we provide our students with meaningful collaborative learning experiences. Moreover, the concept of the corporation of the 21st century will be encompass virtual corporations a professional colleague will as likely be across the country or across the ocean as across the hall. If we are going to prepare our students for the working conditions of the 21st century we should begin by preparing them to work collaboratively in an online environment.

Collaborative learning is one of the activities we believe can be supported in the online learning environment. There is evidence that collaborative learning in an online setting can be as effective as in a face-to-face setting [Hiltz & Benbunan-Fich 97, Ben-Jacob & Levin 98a]. Our research includes a study of the effectiveness of student collaboration in online environments.

Ben-Jacob has taught Discrete Structures both online and in the traditional classroom setting and in the Spring semester of 1998 taught both the traditional and Internet sections concurrently. This allowed for a closer comparison of the two learning environments. The same material was covered and the same types of examinations and projects were assigned to both classes. This particular course at Mercy College is a junior level achievement course. As such, it is used to evaluate the students in the competencies of written communication, logical thinking and quantitative reasoning. To date, this has been done via a semester project that each student completes individually. In Spring 1998, however, Ben-Jacob assigned two such projects to students in both sections. One was done individually and the second project collaboratively. For the team project, students in the traditional section met face-to-face, while students in the Internet section used e-mail for their collaboration. Students were asked to

describe and critique their own and their partners approaches to problems; they were evaluated with regard to all the competencies.

In the Winter 1998 Quarter at DePaul University, students in Levin's Ethical and Social Issues in Computing worked collaboratively in groups of three on projects. Half of the teams met face-to-face to work; while the other half used e-mail, HyperNews, and the DePaul Annotator, a web-based tool to support annotation of text, graphics, audio, and video. The final product took the form of a traditional text document, a hypertext document, or videotape.

Our evaluation of the comparative effectiveness of face-to-face and online collaboration is based upon a student survey and our assessment of the products of these collaborations. A copy of the student survey is attached as an appendix to this paper. The results of the study showed that at DePaul students had some added difficulty managing collaboration without face-to-face meetings, but the quality of work was no for those working at a distance was as good as for those who met face-to-face. At Mercy College the quality of work produced by the collaborative team working at a distance was significantly better than for those in the traditional class.

Future research plans include a distance learning course jointly offered by both Mercy College and DePaul University. Learning groups will be formed in such a way as to include a mix of students from both institutions. Of course, surveys to measure student opinions and levels of satisfaction will be administered.

Based on their preliminary results we contend that central to the educational model of the 21st is the concept of a Collaborative Learning Network (CLN). Elsewhere we have described the CLN as a learner-centered human network designed to facilitate interaction and collaboration among learners as well as between learner, instructors and other learning professional [Ben-Jacob and Levin 98b].

The new millennium brings with it an innovative model of learning into the environment of higher education. The roles of the teacher and the learner will be changing and the need to incorporate collaborative learning into this model is fundamental in order to insure educational success.

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Appendix
Student Survey on Distance Education and Collaborative Learning

'Please answer the following on a scale of 1 to 5.

1- strongly disagree 2 - disagree 3 - no opinion 4 - agree 5 - strongly agree

Part I - Distance Education

1. Distance learning is a viable means of furthering one's education.

1 2 3 4 5

2. Student work in an online course should be assessed the same as students taking the course in a traditional classroom setting.

1 2 3 4 5

3. Students have to alter their learning styles when taking an online course.

1 2 3 4 5

4. Instructors have to alter their pedagogical styles when teaching an online course.

1 2 3 4 5

5. Assignments in an online course should be harder than the assignments in the same course taught in the classroom.

1 2 3 4 5

6. Exams in an online course should be easier than the exams given in the same course taught in the classroom.

1 2 3 4 5

7. Projects in an online course should be more complex than the projects assigned in the same course taught in the classroom.

1 2 3 4 5

8. The integrity of the academics in an online class is lower than that of a class taught in a traditional setting.

1 2 3 4 5

9. If I had to take a course and had my choice of environments, I would take it as a distance learning course.

1 2 3 4 5

10.It is easier to learn the material presented in a course in a traditional classroom setting than in an online environment.

1 2 3 4 5

11. Distance learning programs will grow in popularity in the future.

1 2 3 4 5

12. It is better to use technology to enhance a traditional classroom environment than to deliver an entire course in a distance mode.

1 2 3 4 5

13. The Internet is an effective medium for distance education.

1 2 3 4 5

14. Interactive video is an effective medium for distance education.

1 2 3 4 5

15. Broadcast video is an effective medium for distance education.

1 2 3 4 5

16. Videotape is an effective medium for distance education.

1 2 3 4 5

17. CD-ROM is an effective medium for distance education.

1 2 3 4 5

18. Telephone and voice mail form an effective medium for distance education.

1 2 3 4 5

19. Written correspondence is an effective medium for distance education.

1 2 3 4 5

18. A combination of media should be used in any distance learning course.

1 2 3 4 5

Additional Comments:

Part II - Collaborative Learning

1. When working collaboratively, I am able to communicate effectively with other members of my group.

1 2 3 4 5

2. Our group was able to work effectively as a team.

1 2 3 4 5

3. I learned from the other members of my team.

1 2 3 4 5

4. My team members learned from me.

1 2 3 4 5

5. I contributed more than the other members of my group.

1 2 3 4 5

6. I am comfortable having my responses(s) determined by a collaborative effort.

1 2 3 4 5

7. The appropriate amount of time was taken for group management.

1 2 3 4 5

8. I learned more doing this project collaboratively than I would have working individually.

1 2 3 4 5

9. It is easier to work alone than as part of a group.

1 2 3 4 5

10. When working collaboratively, everyone in the group should receive the same grade.

1 2 3 4 5

11. Every team member should evaluate the percentage of work input by the other members to aid in the evaluation process.

1 2 3 4 5

12. Every team member should evaluate the quality of work input by the other members to aid in the evaluation process.

1 2 3 4 5

13. I consider myself a proponent of collaborative learning.

1 2 3 4 5

14. Collaborative learning works better in the traditional classroom environment than in the distance education environment.

1 2 3 4 5

15. The ideal number of persons per team for collaborative projects is:

2 3 4 5 6 greater than 6

Additional Comments:

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