

WORKING PROFESSIONALS AS PART-TIME ONLINE LEARNERS

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ABSTRACT

This paper discusses a completely on-line graduate professional degree program at Drexel University. The paper provides an overview of the on-line initiative, including background, program development, and a description of the on-line environment. Following this, the paper contains a discussion of results of the degree program and proposes some characterizations of on-line learners and of desirable instructor attributes.

I. INTRODUCTION

This paper discusses teaching and learning in an on-line graduate degree program leading to Master of Science in Information Systems (M.S.I.S.). To provide some particular examples throughout the discussion, the paper focuses on an introductory course in systems analysis. This course is typically the first course taken by students in the degree program.

The on-line M.S.I.S. is part of an initiative of the College of Information Science and Technology (IST) at Drexel University to develop ALN capabilities [1]. Other goals of this initiative include efforts to apply ALN techniques to training in industry, and to develop the delivery infrastructure for ALN training and education.

The remainder of this section provides an overview of the institutional environment, the steps to developing the on-line program, and the structure of the degree. Additional information about faculty issues is provided in a related case study [2].

A. Environment

IST is a multi-disciplinary college focused on application of technology to meet information needs of individuals and organizations. The College began more than 100 years ago as one of the first library schools in the country, and for many years offered a graduate program in Library and Information Science. In the 1970s, the faculty had the foresight to realize that the future of their profession was unavoidably tied to information technology and started a transformation of the College that continues today.

At present, the College has more than 1,100 students and offers five degrees. For undergraduates, the College offers a B.S. in Information Systems. At the master's level, the College has programs in Library and Information Science, Information Systems, and Software Engineering. The College also offers a Ph.D. The student population has grown steadily and the faculty has expanded rapidly in recent years. The faculty members represent a variety of disciplines, and research strengths include Information Science, Database Systems, Human-Computer Interaction, and Software Engineering.

B. Program Development

The history of the Drexel on-line initiative can be mapped into several phases. Overall, these phases have led from having no presence in on-line education to offering an on-line degree for general public enrollment. This evolution has encompassed the following phases:

- **Startup** - In this phase we developed an initial infrastructure and created initial courses for delivery on-line. The infrastructure development included selection and installation of hardware and software, development of an on-line delivery environment, and development of an initial operating approach.
- **Offering Individual Courses** - The next phase included offering a selection of courses on-line each term. Students from our traditional degree program, who took most of their courses face-to-face, took one or several courses on-line. This phase allowed gradual conversion of a series of courses for on-line offering. It also allowed time to improve the on-line environment and refine the infrastructure and operational approach.
- **Offering the Entire Degree On-line** - With the capability to offer a series of courses via ALN solidly in place, the next phase made the major step of offering the degree entirely on-line. Students accepted into the degree program in this phase are taking all of their classes on-line. They will never need to come to campus.
- **General Public Enrollment** - The first several classes for the on-line degree were comprised entirely of students from corporations with whom Drexel developed partnerships for delivering the degree. This arrangement simplified the marketing for the degree and helped ease some of the start-up problems. During this phase, Drexel continued with existing partners and worked to develop new partnerships. (Later, individuals were allowed to apply for the on-line degree program. This change necessitated adjustments to the marketing efforts and to the operational approach used.)

C. The M.S.I.S. Online

The M.S.I.S. delivered on-line or traditionally, is a professional degree with no research option. The students are typically part-time students who work full-time. The program consists of an eight-course core plus four distribution courses and three electives. Students with substantial relevant professional experience can request a reduction in the number of elective courses required. The on-line program is structured so that students qualifying for this reduction can complete the degree in about three years of part-time study.

The first group of students in the on-line degree program began their course work in fall 1996. The degree they are completing is equivalent to the degree offered on-campus in traditional classes, but these students will never have to attend a class on-campus. All their work will be done via ALN. This notion of one degree with two delivery modes is central to our approach. In every way possible-including the set of courses, the faculty, course content, admission requirements, and graduation requirements-the degrees are the same. The method of teaching may vary as appropriate for the medium, but the goal is to provide an equivalent learning experience.

Students in the ALN degree program move through their courses in a group. This approach has helped make the program start-up more manageable since we do not need to have all the courses available in ALN versions at once. The cohort approach also fosters the building of an on-line learning community. Students have more time to get to know each other and to learn about each other's working style.

II. RATIONALE

The motivation for the on-line degree included the following factors:

- **Market expansion** - The ALN project was an opportunity to expand the market for the M.S.I.S. Since the student population for the traditional degree is primarily working professionals, almost all of the students come from the Philadelphia metropolitan area. The on-line degree makes the M.S.I.S. available to students beyond commuting distance from the Drexel campus. It also makes the degree available to students who cannot attend traditional classes due to other time demands such as business travel and childcare.
- **Fit to the College** - IST emphasizes applied research related to information science and technology. The College is building research strengths in areas such as human-computer interaction and computer-supported collaborative work that are closely related to delivery of a degree by ALN.
- **Ability of Students** - Students in the M.S.I.S. tend to be more technically adept than the general population. This makes the student population strong candidates for being able to deal successfully with the technology of ALN.
- **Appropriateness for Students** - Our students are increasingly operating in an on-line world in their professional lives. One side benefit of the degree is that students get a lot of practice in communicating and performing group work on-line. One of our initial industry partners in the degree program found this particularly appealing. As with many large corporations, this organization had major information systems groups scattered across multiple locations. People in these locations are increasingly working together in virtual teams. The sponsoring managers felt that the ALN experience might help these teams by building relationships across sites and helping people develop skills at working on-line.

III. BACKGROUND

The on-line M.S.I.S. was the first substantial effort in on-line education at Drexel University. In addition, the on-line degree was unusual for Drexel in that the University does not have a strong tradition of offering degrees via any form of distance education.

On the other hand, the notion of technology-supported education is very much a part of Drexel's orientation. The University's strengths are in technical disciplines and this bias among the faculty translates regularly into approaches to education. Drexel was one of the first universities to require all incoming freshmen to have access to a personal computer. The University selected the Apple Macintosh in 1984 when the machine was first introduced. Over the years, extensive use of education software, messaging, class list servers, and course materials available on central servers has become a normal part of the Drexel experience. In recent years Drexel has regularly been identified as one of the "most wired" campuses in the country. With the rise of the Internet, the technology-based education techniques of the early PC era have quickly moved to the World Wide Web.

Since the start of the on-line M.S.I.S. several other on-line education efforts have started at Drexel. Each of these has been a college-level initiative, and each has taken a somewhat different approach. Although there have been discussions among the groups involved, thus far there has not been an attempt to merge the various efforts. In part this reluctance to merge efforts reflects the difficulty of coordinating across organizational boundaries. But it also reflects the feeling that multiple approaches may be a good idea given the state and rapid pace of change in on-line education.

A. Students

The students in the degree program are predominantly working professionals, including software developers, system analysts, database administrators, and people working in other information technology jobs. Figure 1 contains a profile of the students in the program. In addition to having substantial work experience, about half of the students have prior technical degrees, including computer science, information systems, and engineering.

Characteristic	
Average age	37
Average years work experience	14
Prior information technology degree (%)	
Yes	46
No	54

Figure 1. Student Profile (n=66)

Technical skill among the students varies considerably, but virtually all the students are familiar with PCs, typical desktop productivity applications (a.k.a. Microsoft Office), and E-mail. On the other hand, very few of the students have any prior experience with on-line learning or other forms of distance education.

B. Enrollment

Most classes in the traditional M.S.I.S. have a maximum size of 25 although some of the core courses frequently are capped at 30 when demand is high. Advanced classes tend to be somewhat smaller. The average class size for the traditional M.S.I.S. is 21. The general approach for the on-line program is to use the same class size as for traditional classes. This means that the target maximum is about 25. Actual enrollments have varied and average class size is 22. Total enrollment in the on-line program as of spring 1999 was about 120.

IV. METHOD

This section provides a brief overview of the technical infrastructure for the on-line program, the approach to delivering course content and evaluating students, and the process used to convert courses for delivery on-line.

A. Technology and Infrastructure

The production environment for on-line degree delivery is a custom Lotus Notes application developed at Drexel. We have worked with other products, including FirstClass and LearningSpace, but not adopted them for production use. Given the growing number of commercial products and rapid evolution of existing products we expect that at some point we will be able to switch to a commercial course management system to reduce technical support effort. Our general technical approach has been to use proven, commercially available products wherever we can.

Our expectation for students is that they have access to a medium configuration PC. Currently, we define that as at least a low-end Pentium with 16 MB of memory and a multi-gigabyte hard drive. Many students access the on-line environment by dial-up Internet connection and we recommend a 28.8Kb or better modem.

The production servers for the on-line program are hosted by a commercial service. This service provides 24x7 support for the servers and technical support related to Lotus Notes for the students. The commercial service provides the primary access point for students and a secondary access point for faculty. Within the College we host servers used for development for primary access to the on-line environment for faculty and staff.

To match the typical student client PC, course materials generally consist of text and graphics. Thus far, we have not used streaming media. However, since PCs capable of handling moderate levels of audio and video material have become commonplace in the last few years, we are planning to begin expanding our use of these technologies in the production courses.

B. Content Delivery

Our approach to on-line education emphasizes interaction among students and between students and the instructor. We combine this with a goal of providing as much flexibility in time and place of participation as we can. And, of course, we want to achieve these goals while maintaining the same quality educational experience found in our traditional courses. This approach builds on earlier efforts in computer-mediated communication [3].

In the sections that follow, we describe various aspects of how we approach on-line courses. The discussion begins with a description of the on-line environment that is common to all our courses. This is followed by categorization of various elements used to deliver a course. Finally, the section ends with some discussion of assessment approach.

1. The On-line Environment

The on-line environment includes a student services area and areas for each course. All students have access to the student services area, but only students registered for a class can access the course area. The sections below provide a brief description of the on-line facilities.

a. Student Services

These services provide some of the functions of the administrative offices and the student union of a physical campus. The on-line facilities consist of both reference materials and interactive features. Among them are

- **Administrative Reference Materials** - These include information about IST administrative policies and procedures and course description material similar to that found in a course catalog.
- **Degree Program Reference Materials** - These provide a central location for general administrative announcements, answers to frequently asked questions about the on-line environment and administrative issues, and a set of personal profiles of students, faculty, and staff.
- **Student Lounge** - This provides a forum for ad hoc discussions among students from all cohorts. Topics range from issues related to the ALN environment or course content to purely social exchanges such as movie and music reviews and discussions about the weather. Faculty can and often do participate in these discussions.

b. Course Environment

Over the time that we have been delivering courses on-line, our course environment has evolved. In general, we have been working with the following services and materials for a course:

- **Course Materials** - This area contains on-line versions of books, journal articles, the syllabus, and other supplemental material that students need for the course. Readings are available on-line for some courses. In our initial ALN courses, we made a consistent effort to provide all the course materials on-line whenever possible. While students find this convenient, a high percentage print most of the on-line materials and work with them from paper. After observing this trend we have changed our approach and now work from printed matter for much of the reading material.
- **Class Discussion** - Class discussions are a key element of many of our courses even though, in this context, discussion takes place asynchronously. The class discussion area is a threaded discussion forum accessible to all participants of the class. The ability to interact regularly with both the instructor and other students is one of the key aspects of our on-line approach that separates it from technologies like computer-based training (CBT) in which students work alone.
- **Group Discussion** - In addition to the class discussion area, we provide an area for assigned or ad hoc discussion by smaller groups. Any group within the class can create a threaded, private discussion area of its own. Most often these discussion areas are used to support team project work.
- **Assignment Submission** - Most assignments are submitted to a public area to which all students have access. Critique of assignments by the instructor and by other students is often built in as part of the learning experience. We have also worked with versions of the on-line environment with more elaborate access control options for assignments. For example, under one approach, when students submit assignments, they are accessible to the instructor only. After all teams have made their submission, the instructor has the option of granting access to all the students. In general though, most instructors have opted for E-mail submission when they want more control over access to assignments.
- **E-mail** - Each person has a mailbox on the system. The importance of this feature has declined over the years, since most students have at least one Internet E-mail account. However, having E-mail within the ALN provides a uniform mechanism for person-to-person communication. This is useful for dealing with attachments since the problems that sometimes arise in sending files from one mail system to another can be eliminated. In addition, it allows for simple administration of a common address book.

This set of facilities provides reasonable support for a variety of courses and also provides a look and feel for the on-line environment that is common across courses. We discuss below how these facilities are applied in courses.

2. Example Course

The course used as an example in this paper is an introductory, graduate-level course in systems analysis that is the initial course in the M.S.I.S. The course focuses on processes for system definition, modeling, and analysis, and the role of these activities in ensuring success in systems development. The course provides an introduction to modeling and analysis tools and techniques useful for leveraging software and information technologies to achieve organizational objectives. Students learn and practice modeling software systems with respect to functions, processes, and data. The modeling techniques employed in the course are common techniques of structured systems analysis.

3. Course Structure

Although the on-line course is asynchronous, it is not self-paced. The course runs on the normal term

schedule, which at Drexel means a quarterly term with ten weeks of class plus an exam week. In addition, the on-line class is organized into activity windows. For our courses these time periods are typically one to two weeks, and in this course we use one-week activity windows. Within each activity window students are expected to complete or participate in certain course activities. The course is asynchronous in that students control when they perform their work within each activity window. None of the activities require that the students participate at any fixed time.

The principal course activities for the systems analysis course are reading, discussion, "homework" assignments, and a test. Figure 2 provides a summary of these activities and shows the relative weight of each in determining a student's final grade. The paragraphs that follow discuss each of these activities in some detail.

Activity	Comment
Reading	Lecture notes, 13 Chapters of course text; 6 journal articles
Discussion	During 8 weeks; 30% of the grade
Assignments	During 8 weeks; 40% of the grade
Test	1 test; 30% of the grade

Figure 2. Summary of Course Activities

a. Readings

The basic readings in the course are the same as those in the traditional class. There is a textbook and a set of journal articles. The text covers all the general topics for the class and provides detailed explanation of the modeling techniques used. The journal articles provide additional depth on selected topics including business process reengineering and system engineering concepts.

We rely on paper copies of the basic reading materials for the course. Students purchase textbooks from the university bookstore, as any student would do. The only difference is that these students can make their purchases by phone and the bookstore will ship texts to them.

We have experimented with putting course reading material on-line; however, doing so can lead to copyright complications that are difficult to resolve. Our situation is somewhat simplified by the fact that only students in the class have access to the course materials. Nonetheless, copyright issues must be considered before placing material on-line.

More important than copyright considerations, we simply have not found on-line materials to be that useful. We have had situations in which the course instructor authored the textbook or other course materials and so copyright issues were easy to address. In some of these cases we have posted journal articles and even entire textbooks on-line. Our observation has been that students tend to print the on-line version and read the paper copy. Given that, it is easier for all concerned to simply start with paper versions of the materials.

b. Lectures

Listening to lectures does not appear in the list of class activities in Figure 2. In the traditional class, there is a weekly three-hour class meeting that typically includes a lecture-style presentation by the instructor. An obvious question is how the lecture component is handled for an on-line class. The replacement for lectures is not a single corresponding on-line activity, but parts of several different activities. Lecture

notes, discussion, assignment feedback, and even private E-mail all carry some of the material that might appear in a lecture in a traditional class. A key question and one that has been the subject of many discussions among faculty involved with our on-line program, is how the sum of these parts compares to the whole package of information delivered in lectures.

This issue of delivery of lecture material is closely related to the shift in our on-line courses from teacher-centered courses to student-centered courses. With a student-centered approach the instructor serves more as a coach to students and even as a fellow explorer rather than a font of knowledge separate from the students. A student-centered style of teaching requires more interactions that are informal and created in response to situations that arise with the class during the term.

Even faculty members who are comfortable with a student-centered approach may find it difficult to implement this approach on-line. Since the on-line mode of delivery is new, it is natural to scrutinize and compare it with the traditional approach. Also, since the on-line delivery of course material is more spread out than in a lecture-based course, it is harder to add up the various on-line activities and judge whether they are equivalent to the material delivered in lectures.

The lecture delivery issue we describe here has more to do with the style of the course than with the on-line delivery mode. A face-to-face class that uses discussion and other interactive techniques is difficult to compare to a lecture class.

c. Lecture Notes

The most obvious replacement for traditional lectures is instructor-written, lecture notes. However, these notes are not just transcripts of lectures that might be given in a traditional class. Our experience has been that the lecture notes serve a variety of purposes. Key to understanding their use is that lecture notes are an area of the on-line environment to which only the instructor has access. This means that students know that any posting made to this area is from the instructor, and so they tend to follow these postings closely. In addition, there are usually only a few lecture notes posted in a given activity window. The combined effect of these two attributes means that lecture notes are very visible to the class.

Following are examples of types of lecture notes used for the systems analysis course and other on-line courses:

- **Static Content Notes** - These are fixed writings that the instructor can prepare before the start of the term and use in subsequent terms. They are directly analogous to lectures delivered in a traditional class, but they often contain less material than would be covered in a lecture. For the systems analysis course, the text and articles provide the detailed static presentation of course content. The static lecture notes provide introductions to topics, summaries of important points, and detailed presentations of particular topics that the instructor knows students find troublesome, or for which the instructor finds the text coverage lacking.
- **Dynamic Content Notes** - These are lecture notes that the instructor writes during the term that address issues related to course content. One example is for an instructor to post her or his summary of a discussion as a lecture note. Over the period of an activity window a good discussion can generate dozens and dozens of postings. Some of those postings will contain important points, some minor points, and some will be off the topic or just plain wrong. A summary by the instructor can help students grasp and retain the best of the material. While the summary could be posted to the discussion area, posting it to the lecture notes makes it more visible and easier to find later when a student might be reviewing course material.

- **Dynamic Course Process Notes** - These notes help the students deal with the process of the course. They are analogous to general instructions to the class given in a traditional course. They seem to be useful particularly in on-line courses since students are learning how to operate in an on-line environment. These notes might include comments on how discussion is proceeding, or operational issues related to a group project. The notes can also be used to provide words of encouragement through praise for the class as a group or comments about what the class has accomplished. The static counterpart to these notes includes the syllabus or other documents an instructor would prepare before the term. There is a separate area in our on-line environment for the static course process material.

d. Discussion

The discussion area supports threaded, asynchronous discussions. Synchronous facilities such as chat rooms are not used. The discussion is typically the most active part of our on-line courses and the grade for participation reflects this (30% of the final grade for the systems analysis course).

Discussion within an activity period typically centers on one or several discussion topics that the instructor provides for an activity window. However, students can also post discussion issues, and sometimes do. In the systems analysis course the instructor serves as discussion facilitator. In some of our other courses, instructors have students facilitate the discussion. The role and effects of facilitation by the instructor or students are much the same as for discussions in traditional classes.

Our approach to discussion relies on having students with substantial work experience. We try to bring that experience into the discussion so that students will connect what they are learning with their own experience so they can benefit from each other's experiences.

For the systems analysis course, most of the discussion falls into one of two categories. The simpler discussion relates to factual course material such as modeling techniques. Here the discussions tend to be requests for explanation or clarification of facts. The larger category of discussion (at least in terms of volume of postings) relates to areas that are more subjective, or more varied. Examples include the appropriate role for end users in system development, and discussions of how particular systems development issues appear in each student's own workplace.

e. Assignments

Assignments are much the same on-line as in a traditional class. For the systems analysis class these assignments are mostly modeling exercises in which students apply various techniques of structured systems analysis. On-line assignments can be submitted to the instructor only or submitted so that they are accessible to everyone in the class.

The ability for students to easily see work of other students creates options in an on-line class that are difficult to arrange in a traditional class. Most instructors have had the experience of getting insights by looking at several answers to the same problem, but students seldom have this experience. In an on-line course, they can. For example, for some of the systems analysis modeling assignments, the assignment has two parts. First, each student does the assignment for herself or himself. Then, after submitting her or his own answer, the student reviews another student's answer and critiques it. This gives each student four perspectives on the assignment: their own, that of the student they critique, that of the student that critiques them, and that of the instructor.

f. Test

Discussions of on-line courses often raise the question of how to control exams and tests. Although some on-line programs make use of remote volunteer proctors, we have not taken this approach. Rather, we use tests in the style of a take-home test in a traditional course. Students are allowed to use books, notes, and even the on-line material created during the course. The test for the systems analysis course includes short essay questions on general aspects of systems analysis, and several analysis exercises built around a small case-study problem.

C. Evaluation

Since the Drexel project involves a degree program, the evaluation framework encompasses the degree as well as individual courses [4]. Following are some of the evaluation instruments we are using:

- **Background Questionnaire** - This questionnaire is administered before students start the program and is used to gather data in several broad categories. The first is demographic data such as age and gender that allows us to look for systematic differences among students based on demographic factors. A second group of factual questions addresses possible predictors of success and failure. These include factors such as native language, typing ability, technical background, and prior education. A third group of questions probes perceptions and expectations about the ALN program. We can track changes in these factors as students participate in the program.
- **Baseline Knowledge Test** - This test samples student knowledge at the beginning of the degree program. The test is a series of short essay questions that are graded by expert evaluators. We adopted this more subjective evaluation approach after careful consideration of a knowledge test based on objective questions. We concluded that to evaluate a graduate program essay questions would provide more insight into overall student knowledge and higher-level skills including analysis and synthesis.
- **Post-Course Evaluation** - This questionnaire gathers student opinions and estimates of some factual items at the end of each course. The opinion questions explore the student's reaction to course content, the instructor, and what the student learned without reference to ALN delivery. It also asks about the ALN aspects of the course. In addition to providing opinions, the students provide estimates of the time they spent on the course, when they did the work, and where they worked. They also provide input on problems they encountered due to the ALN.

V. RESULTS

This section presents measures related to several facets of operation and outcome of the on-line courses. These sections are followed by some observations about what seems to make on-line classes successful in our environment.

A. Student Participation

The level of student activity in on-line courses is substantial. Figure 3 shows some data on activity in three sections of the systems analysis course. These numbers capture only the public messages from these sections. Private communication including E-mail, small group on-line discussions, and phone conversations are not included. The messages shown here are messages that all class participants need to address.

Class Section	A	B	C
<i>Student Messages</i>			
Discussion	602	314	1240
Assignment	117	75	523
Total	719	389	1763
<i>Instructor Messages</i>			
Discussion	243	90	121
Assignment	133	26	37
Total	376	116	158
<i>Total messages</i>	1095	505	1921
Class Size	18	13	31
Instructor Messages per Student	21	9	5
Student Messages per Student	40	30	57

Figure 3. Public Messages in Three Class Sections

A quick review of the data shows that there is substantial variation among the sections. In part this is due to differing class size but even the normalized messages-per-student data shows variation by a factor of about two. There are a variety of factors that seem to cause this variation. These sections each had different instructors with substantially different styles. The number of discussion questions varied somewhat from class to class. Two of these sections had more than one instructor participate. Section A had a second instructor who participated in discussion for about half the term. Section B had a second instructor, but in that case the instructors divided the work rather than both participating at the same time. Section C had a single instructor. Finally, much like traditional classes, groups of on-line students tend to have distinct characteristics. Since students in the on-line program move through the curriculum in cohorts, we can see these characteristics in a series of courses. The cohort in section C has repeatedly shown itself to be very active in addition to being fairly big.

B. Student Evaluation of the Courses

In spite of the variation in activity, all of these sections were well received by students. Figure 4 contains some data from post-course evaluations. The Overall Evaluation for the instructor and course shows the mean value for a ten-point scale on which 1 is "Poor" and 10 is "Excellent". We use identical questions for all courses we teach, both on-line and traditional. Our general experience is that marks of 8 or higher are outstanding. Marks of 6.5 to 8 are good to very good. It is interesting to note that there is not an obvious correlation between the students' overall evaluation of the course and the total volume of public messages. The instructor evaluation is actually inversely related to the number of instructor messages, but there is no clear pattern when the number of instructor messages is normalized by class size. A much larger sample would be needed to explore correlations in a systematic way.

The remainder of Figure 4 shows some facets of student perception of their on-line experience. The Trade-off section shows strong agreement regarding the greater convenience of on-line courses relative to traditional courses. On the other hand, students generally report that they have to work harder than in prior traditional courses.

Finally, the last section of Figure 4 addresses students' assessment about their interaction with the instructor and other students. Students universally report that they are able to interact with both instructors and fellow students. Surprisingly, a substantial number also report that they actually think they interact more with the instructor than they would in a traditional class.

Class Section	A	B	C
<i>Overall Evaluation</i>			
Instructor	7.9	9.1	8.8
Class	7.0	8.5	9.0
<i>Trade-offs (% agreeing)</i>			
More Convenient	79	91	92
Worked Harder	43	73	62
<i>Ability to Interact (% agreeing)</i>			
With Instructor and Students	100	100	100
Communicated More	36	55	27

Figure 4. Sample Evaluation Data

C. Grade Comparison

Based on final grades, students in the on-line courses seem to perform about the same as students in the traditional class sections. One such analysis compared the students in the three on-line systems analysis course sections with students in three traditional sections of the same course. The grade distributions showed no significant difference between the two groups. (Chi square = 0.228, $p = 0.63$, $n = 131$)

Several different instructors taught the systems analysis course sections but only one instructor taught both on-line and traditional sections. Since grading standards may vary by instructor, it is also interesting to consider data that control for variance by instructor. One way to do this is to look at pairs of sections taught by the same instructor.

One such analysis looked at ten course sections, encompassing five of the eight required courses in the degree program. For each course, the sample included one on-line and one traditional section, both taught by the same instructor. In addition, the two sections of each course were taught in consecutive quarters-or, in one case, with a one-quarter gap between offerings. The hope was that this would reduce the impact of any change in grading approach over time.

Across the five course pairs the grades for on-line and traditional students were about the same. The on-line students actually had slightly higher grades, but the difference was not significant. (Chi square = 1.49, $p = 0.22$, $n = 211$)

D. Course Completion Rates

Although student retention is an obvious area of investigation for our on-line degree program, we are only now reaching a point where there is enough history to look at retention over extended periods of time. It will be several more years before we can really look at completion rates for the entire degree. In preparation for that analysis, we have been surveying students who drop out of the program. Some hope to resume their studies after a term or two, and we have already seen students do this. Breaks in progress toward the degree are not uncommon among our traditional students, so this pattern would not be surprising. The reasons students provide for leaving the program mostly relate to personal or professional pressures, although issues related to on-line delivery or use of technology have also been cited. At this point we have too little data to see patterns in the reasons cited.

At present though, we have enough data to look at completion rates for individual courses. As with

grades, course completion rates for on-line students seem to be about the same as for traditional students. For the five pairs of course sections described above, the completion rate for on-line students was slightly higher (92% vs. 88%) but the difference is not statistically significant (t-Test $p = 0.36$, $n = 10$)

E. Observations on Teaching and Learning

This section summarizes observations on some of the key issues that seem to affect outcome in our on-line courses. They represent a summary of observations about students and faculty in the Drexel on-line courses.

1. Characterizing Student Participation

Students vary substantially in their approach to an on-line class just as they do in a traditional class. A student's behavior may change over time due to external factors, e.g., how busy they are at work, their interest in a particular course, or their level of relevant experience. Nonetheless, at a given time, there are some typical behavior patterns that seem common among students.

The paragraphs that follow describe a range of student behaviors that seem common and important in on-line classes. Some of the behavior types may occur in combination, but the individual stereotypes seem to be a useful reference model for characterizing and thinking about what is going on in a class. The L model of student participation characterizes behavior by identifying the following types of student participants in on-line classes:

Leading The leading students are visible on-line early and often. They frequently post one of the first responses to a discussion topic and contribute regularly throughout. They respond to postings by other students not just to postings by the instructor. The activity of the leading students may be key to the overall activity level of the class.

Lucid The lucid students write with special clarity. Their contributions tend to add real value not just volume or noise to the work of the class. Other class participants are likely to read postings by the lucid students because they have something worth saying and they say it in an easy to understand manner.

Lively The lively students bring humor and a light touch to the class. They make participating more enjoyable for everyone. They may also be particularly important in helping to form and maintain a sense of community on-line.

Lurking The lurking students are present but invisible. They follow class activities, but do not participate. While a few students in a class could learn this way, if there are too many lurking students effective interaction among class participants will stop. The class misses whatever the lurking students could contribute and there are fewer bases for evaluating lurking students.

Listless The listless students participate, but not very much. They are not very motivated, and seem immune to efforts to encourage more class participation. Like lurking students, the listless students do not have much negative impact on the class as long as there are not very many of them.

Lagging The lagging students are always a few steps behind the rest of the class. When they participate, they tend to contribute at the last minute. Other times they do not contribute at all since they are too far behind in their reading or other independent work. Asynchronous discussion requires participation over a period of days if there are to be a reasonable number of interactions among the participants. If everyone waits until the final few hours of a discussion period, discussion

degenerates into a series of disconnected postings.

Lost The lost students are missing in action. They come in two distinct groups. The first group includes students who are not participating in the class at all. The second group includes students who are contributing, but whose contributions are generally off the topic or erroneous.

2. Desirable Attributes for On-line Instructors

Teaching an ALN class is both the same and different from teaching a traditional class. Experienced instructors seem to find that much of their knowledge about teaching transfers quite nicely. On the other hand, some instructor characteristics seem to be particularly important for an on-line class. The characteristics listed below focus on how an instructor interacts with students and sets the tone for the class.

Desirable characteristics for on-line instructors include the following:

Motivated Motivated instructors have a strong interest in working to make their on-line class successful. They are willing to make the effort to deal with technology and a new teaching and learning environment.

Approachable Approachable instructors encourage students to interact with them. Being approachable reduces barriers to interaction in the on-line environment.

Visible Visible instructors make their presence felt frequently in the on-line environment. This helps add substance to the on-line experience and to provide glue to hold the community of learners together.

Explicit Explicit instructors provide timely, detailed directions about what the students need to do and how the class will operate. They are also explicit in addressing course content. This helps to ameliorate the limitations of the restricted communication channels in the on-line environment.

Pro-active Pro-active instructors make an extra effort to reach out to students in ways beyond what would be necessary or typical in a traditional environment. For example, a pro-active instructor might put extra effort into contacting an inactive student in an on-line class.

Discrete Discrete instructors manage a class without dominating it. They facilitate on-line discussions while encouraging students to provide most of the comments. They also know when to comment publicly and when to switch to private communication with a student or students.

Collaborative Collaborative instructors are willing to work with staff and other instructors engaged in on-line education. They are also comfortable working with students in a coaching role rather than a more hierarchical style.

Technically Capable Technically capable instructors have sufficient technical knowledge and adeptness to be comfortable with the on-line environment. On-line instructors do not need to be technical experts but they need basic technical skills to get started. They also need to be able to deal with the inevitable technical glitches and technology changes (with technical support help).

Credible Students accept credible instructors as experts in the subject of the course. Past research has shown the importance of credibility, particularly in technical fields, including information systems. For on-line classes this may be even more important since the student's connection to the university is embodied largely in interactions with the

instructor

As mentioned at the beginning of this section, these descriptive models of student types and instructor attributes are the result of observation of classes in our on-line environment. The plan for continuing evaluation of the Drexel program includes an interest in exploring quantitative support for these models.

REFERENCES

1. **Andriole, Stephen J., Lytle, Richard H., and Monsanto, Charlton A.** Asynchronous learning networks: Drexel's experience. *T.H.E. Journal*, Vol. 23, No. 3, pp. 97-101, October, 1995.
2. **Hislop, Gregory W.** ALN teaching as routine faculty workload. To be published in an upcoming issue of the *Journal of Asynchronous Learning Networks*, 2000.
3. **Hiltz, Starr Roxanne** *The Virtual Classroom*. Norwood, NJ: Ablex Publishing Co., 1994.
4. **Hislop, Gregory W.** Evaluating an asynchronous graduate degree program. *Proceedings, Frontiers in Education, Institute for Electrical and Electronic Engineers*, 1997.

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