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ABSTRACT

According to this paper, distance education exists as a means to provide access to students who might otherwise not participate in higher education due to any number of constraints, whether internal or external. Sinclair Community College is an urban, commuter college located in Dayton, Ohio. It has a fall headcount of roughly 20,000 students, with approximately 10% of the FTE generated from distance learning. Sinclair offers a distance learning program that provides many alternatives to on-campus classroom learning. Sinclair opted to begin an exploration of its distance-learning program by comparing the performance and persistence of students involved in different course delivery modes. The study considered four categories of distance learning: (1) videocassette; (2) televised interactive; (3) Web-based; and (4) audio. The study used a matched pairs design to match distance learners with students in traditional classes by age, gender, and ethnicity. The distance learning group had a mean course grade of 2.31, and the traditional group had a mean course grade of 2.81. In addition, distance learners were less likely to enroll in any class at Sinclair the following quarter (65.3% compared to 73.5% of the general population students). Concludes that distance learners are more apt to be juggling jobs and family obligations. (Contains 10 tables and 16 references.) (NB)

Does Distance Learning Make a Difference? A Matched Pairs Study of Persistence and Performance Between Students Using Traditional and Non-Traditional Course Delivery Modes

Sinclair Community College

DOES DISTANCE LEARNING MAKE A DIFFERENCE?

A MATCHED PAIRS STUDY OF PERSISTENCE AND PERFORMANCE BETWEEN STUDENTS USING TRADITIONAL AND NON-TRADITIONAL COURSE DELIVERY MODES

Technological advancements, along with the rapid expansion of the Internet, are bringing about a proliferation of distance learning (DL) opportunities. An October 1997 report published by the National Center for Education Statistics counted 753,640 enrollments in distance learning courses in Fall 1994; 55% of those enrollments were at public, two-year institutions (Lewis, Alexander & Farris, 1997). More courses and degree programs, from an ever-widening realm of providers, introduce new and exciting opportunities for students to pursue and acquire knowledge when they want, how they want, where they want, and from whom they want. But is it what they need? If the students engaged in distance learning are not reaching the level of achievement attained by their "on-the-campus, in-the-classroom" peers, then conceivably they are not realizing the full benefit of the alternative mode of learning. If they do not persist in their education, then perhaps DL failed to meet its promise. There are a myriad of scenarios to be explored; criteria to be judged; assessments to be examined.

Sinclair Community College is an urban, commuter institution located in Dayton, Ohio. It has a Fall headcount of roughly 20,000 students. Approximately 10% of the FTE generated come from distance learning; and distance learning FTE increased just over 7% between Fall 1997 and Fall 1998. Sinclair elected to begin an exploration of its distance learning program by comparing the performance and persistence of students involved in different course delivery modes. These results will provide the jumping off point for further analyses into such areas as reasons for attrition/persistence, student satisfaction, course (and program) design, faculty preparation and support, support services for DL students, and affective characteristics of DL students. This evaluation and research help to will improve not only the distance learning program, but also the entirety of Sinclair's course offerings. "Good distance education pedagogy is good pedagogy in any classroom" (Schlosser & Anderson, 1994).

Background

The rapid rate at which technology—and our ability to utilize it—is changing encourages constant reinvention of the distance learning medium. Sherry (1996) worries that curriculum designers run the risk

of becoming so caught up in the novelty of the latest technologies that they neglect to consider the underlying issues of learner characteristics and needs. Educators need to maintain an awareness of the learner as an individual, for the new technology enables them to individualize the learning process. The distance learner constantly struggles to balance his or her own time and energy management needs with the needs of home and family (Gibson 1998). Gibson (1998) also notes that these learners (who are most often adult non-traditional students) face the additional challenge of "learning to learn at a distance." Much of the research referred to by Cookson (1990) supports the notion that, in order to improve persistence, distance learning programs need to assist students in making the adjustment to learning at a distance. These are important considerations as educators continue to revamp and revise distance education. Improvements in distance learning must address the needs, attitudes, and demands of the typical distance learner—an older, married female who works full-time (Thompson, 1998)—if *effectiveness* is to be improved (or attained). Further, a study of 300 correspondence course students found *accommodation of learning styles needs* to be a major factor in understanding completion and attrition (F.A. Gatz, as cited by Cookson, p. 200).

Conclusions abound regarding the effectiveness of distance learning courses compared to *regular* courses. Much rhetoric has ensued: is there "a significant difference" (Orr, 1998); or is there "no significant difference" (Russell, 1999) between levels of performance and persistence? Most studies conclude that students in distance learning courses (regardless of technology used) perform at least as well as students who have classroom-based instruction (Biner, Dean & Mellinger, 1994; Phipps & Merisotis, 1999). Patterns of persistence, however, do not mirror performance.

General studies have found that the students most likely to persist in distance education are those who possess more formal (post-secondary) education (Moore, 1996). There are a great many circumstances leading to student attrition, whether in on-campus or distance learning courses, and the reasons given by students do not appear to be very different between these two categories of learners. Cookson (1990) cited a number of studies of dropouts from distance learning that reveal such reasons as job duties, course difficulty, and time constraints resulting from family duties.

The well-known persistence model developed by Vincent Tinto suggests social and academic integration as important predictors of persistence [of traditional undergraduate students]. Academic

integration has also been noted as an important factor in the persistence of the adult non-traditional student (Bean and Metzner, 1985). However, these studies focused on the students who attend classes on-campus. Social integration does not appear to account for withdrawal and failure [in telecourses] (Pugliese, 1994). It is no surprise that personal characteristics of the distance learner differ from those of the more traditional student. Biner, Bink, Huffman and Dean (1995) believe that awareness of this fact can be utilized to provide optimal learning opportunities for all students. This point is moreover made by Dwyer: "Quality instruction cannot be randomly designed for random groups of learners...Quality instruction implies that the learning experience provided is in compliance with those prerequisite conditions (both internal and external to the learner) necessary for efficient learning to occur," (p. 222, 1990).

Distance Learning at Sinclair Community College

Distance education exists as a means to provide access to students who might otherwise not participate in higher education due to any number of constraints, whether internal or external. Sinclair Community College's Distance Learning program provides many alternatives to the traditional on-campus classroom environment. The program aims to meet the needs of students who face scheduling conflicts or family and home commitments; are homebound; live a distance from the college; or who just prefer to study independently. Registration methods for distance learning courses are identical to those provided for traditional on-campus courses. Distance learning courses at Sinclair Community College encompass a broad range of departments within several divisions and are equivalent to their "traditional" counterparts in credit hours, transferability to other institutions, and fulfillment of degree requirements.

Sinclair provides distance learning courses in a variety of learning modes. *TV Sinclair* is an independent study program in which course lectures and instructional materials are provided as videocassette, audiocassette, and/or printed materials. Taped telecourses sometimes air on public television and cable but the most popular way for students to take such courses is to have a set of videotapes for home viewing. *Sinclair Electronic College* courses are available on the World Wide Web. Some courses may combine videocassettes lectures with the Internet format. Students in these courses use the Internet to access information and assignments, communicate with the instructor and fellow

students, and participate in discussion forums. Students without a personal computer or a modem can use computers located in the college's microcomputer labs or at Dayton-Montgomery County public library branches. *LEARNing Works* uses audio, video, computer, and other technologies to bring together students from various sites in a live, interactive classroom that encourages active participation and exchange of information and ideas. These courses are taught on-campus and transmitted live to remote sites. The *Off-Campus Credit Program* is a convenient solution for students who desire a traditional classroom environment but are unable to drive to Sinclair's campus in downtown Dayton. Off-campus centers are conveniently located throughout Sinclair's service area.

The recent (Fall 1998) opening of the state-of-the-art *Center for Interactive Learning (CIL)* on campus, which provides faculty with the technology, tools, and instructional guidance needed to move the college into the 21st century, unveiled numerous opportunities for Sinclair's distance learning activities, especially those using Internet technology. Given the novelty of such experiences for many of our students, one aspect of this particular study was to compare student persistence and retention by types of DL delivery modes, particularly computer-based.

The study of distance learning at Sinclair is integral to our *journey toward transformation*...in less than a decade, Sinclair will have transformed from a teaching to a learning college, refocusing from the teacher-to-student conveyance of knowledge to the emphasis and encouragement of self-directed learning. This transformation is a central element of the college's 1999-2000 Strategic Plan. This Plan foresees Sinclair as a learning college, a place where all learners can attain competency through a variety of assessment processes. Individual learners will own and carry responsibility for their learning plans. Options for learning, in terms of content and approach, will be plentiful—for students, faculty and staff alike. Information technology will be a transforming agent that will affect everything. Distance learning will serve as a catalyst for the adoption of learner-centered approaches to instruction. Faculty and counselors working as facilitators, and often as part of a team, will empower students to manage their own learning through a wide variety of alternatives to traditional teaching. Instruction will focus less on content and more on process—the process of acquiring and managing knowledge. Most importantly, we will accommodate individual learning styles and life situations as well as personal and career objectives. Maintaining our commitment to "high tech/high touch" will challenge us to implement processes for greater

flexibility in registration, scheduling, and support services to accommodate expanded learner needs. This move towards more asynchronous learning, fueled by individuals' circumstances and goals, builds upon our endeavors in distance learning.

Purpose of the Study

Distance learning is not new to higher education, or to Sinclair. Numerous research studies have been undertaken to address the efficacy of "non-traditional" modes of teaching (and learning), as well as student perceptions of and satisfaction with such delivery methods. Beyond a routine survey of students taking courses at off-campus sites, however, little study of distance learning had been pursued at Sinclair prior to 1997. Thus, we set out to answer these basic questions about distance learning and the distance learner at Sinclair:

- Do students in distance learning sections perform at least as well as students learning the same material in a traditional setting?
- Is there a difference in the persistence rates (to the following term) of distance learning students versus students who take classes in a traditional setting?
- Are there differences in student performance and persistence rates between distance learning modes?
- Does participation in distance learning affect likelihood of future enrollment in distance learning courses?

Methodology

A study initiated in early 1997 (and the basis of this disquisition) aimed to compare the performance and retention of students in distance learning courses with students in more traditional course formats. Please note that, throughout both phases of the study, *distance learner* refers to a student who took a distance learning course section and not a student enrolled in a distance learning program). The initial study involved students from distance learning and traditional lecture sections of courses during Fall 1996. The courses studied were CIS119 (Personal Computer Applications in Business), LAW101 (Business Law I), MAN105 (Introduction to Business), MAN205 (Principles of Management), PSY119 (General Psychology), PSY121 (General Psychology I), SOC111 (General Sociology I), DEV085 (Fundamentals of Arithmetic), and DEV108 (Introduction to Mathematics). These particular courses were chosen because of high distance learning enrollments. A matched pairs design was utilized and the DL students were matched on age, gender, ethnic category, and COMPASS assessment test recommendations with students who took the same course on campus that quarter. (Note: COMPASS is a computer-adapted placement test used by Sinclair to determine reading, writing, and mathematics skill levels of entering students). The matched pairs design was selected in an attempt to control for variables in student demographic characteristics that might account for differences in performance and persistence between the two groups. In addition to the overall analysis reported here, the initial study did compare performance and persistence on a course-by-course basis.

As a follow-up to the original study, we expanded upon the idea of that initial project by examining student performance and persistence (to next term) of students from three quarters in the 1997-1998 academic year. The matched pairs design of the original study was maintained, but a different method was used for selecting the courses included. As an attempt to control for differences between course preparation, presentation, requirements, and grading criteria as factors of student persistence and performance between DL and non-DL courses, the courses selected were confined to those taught by the same instructor (i.e. an instructor had the responsibility for both a traditional lecture and a DL format of the same course during a quarter). Also, distance learning students were further classified by different delivery modes. Performance was examined as a measure of course success (pass/fail/withdrawal) and mean numeric grade. Re-enrollment the following term and, more specifically, whether or not retained

students enrolled in a distance learning course gauged persistence. Since evidence suggests that successful DL students are more likely to complete subsequent distance learning courses (Moore, 1996), we looked specifically at this practice among those students.

This treatise begins by summarizing the findings gleaned from analyses of the courses in the initial study and is followed by results of the more recent analyses. Conclusions, plans for additional study, and anticipated actions supervene.

Findings

Initial study, 1997

The course grade point for students who earned an A, B, C, D, or F, in a distance learning course section was averaged and compared to the mean grade point in the same course for the matched general population students. Grades were given numeric codes to correspond with quality points (A = 4, B = 3, C = 2, D = 1, and F = 0). Students from DEV courses (which do not receive a traditional grade) and students who did not complete the course were excluded from this particular analysis. A matched pairs t-test revealed that the mean grade point was significantly higher for general population students than it was for distance learning students. The distance learning group had a mean course grade of 2.31 and the traditional group's mean course grade was 2.81. However, there were several courses in which the distance learning students did perform as well as the traditional students, both in mean course grade and overall success rates. College decision-makers have used those results as an impetus to investigate the design, delivery, and content of the courses which yielded comparable performance. The intent is to glean what is different about those courses and incorporate the conclusions into the continuous improvement of Sinclair's Distance Learning program.

Table 1 *Paired Samples t-test (Course Grade)*

					95% Confidence Interval	
N	df	t	ES	Mean Diff.	Lower	Upper
250	249	-4.623***	.188**	-.50	-.71	-.28

Note. For ALL tables: * significant at p<.05; ** significant at p<.01; *** significant at p<.001.

Students were classified as 'successful' or 'unsuccessful' based upon the letter grade obtained in the course. Students who earned a grade of A, B, or C were considered 'successful'; students who earned grades of D, F, W (withdraw) or Z (non-attendance) were classified as 'unsuccessful'. Success in developmental education courses was defined as achieving a grade of P (pass); students who earned a grade of N (progress), F, W, or Z in DEV courses were considered 'unsuccessful'. Chi-square analyses indicated that students receiving traditional classroom instruction were significantly more likely to be successful than distance learning students.

Students were examined to establish whether they had enrolled in **any** course at Sinclair the following quarter (Winter 1997). Generally, distance learning students were less likely to have registered the following quarter—65.3% compared to 73.5% of the general population students ($\chi^2 = 7.478$, $p<.01$).

The group of Fall 1996 students *who enrolled in Winter 1997* was further examined to ascertain enrollment in distance learning course sections the following quarter. A chi-square analysis was performed to determine if distance learning students were more likely than general population students to have enrolled in a distance learning course the subsequent term. The cross-tabulation from that analysis showed that distance learning students were more likely than traditional learners to enroll in a distance learning course the following quarter (23.6% vs. 4.0%). It is interesting to note that the overwhelming majority of students (whether distance learning or general population) did not enroll in distance learning courses the following quarter.

Table 2 *Chi-square tests (N=958)*

Behavior Measured	Distance-Learner	Traditional Student	Chi-square (χ^2)	Lambda (λ)[1]	Phi (Φ)
SUCCESS (A-C)	52.8%	69.7%	28.862***	.030***	.174***
PERSISTENCE	65.3%	73.5%	7.478**	.008**	.088**
RE-ENROLL DL	23.6%	4.0%	55.800***	.084***	- .290***

[1] based on Goodman-Kruskal measure of predictability

Recent study, 1998-1999

The second half of our study employed a slightly different method for selecting the courses to be evaluated. Rather than selecting based upon high distance learning enrollments, courses were selected if both a regular and a distance learning section of the course were taught *by the same instructor during the same quarter*. This was an attempt to control for variability between different sections of the same course.

The students who were enrolled at the official reporting date for the quarter were assigned codes based upon the course section. Those student IDs were run through a program that matched students—from DL and non-DL sections—based upon the same demographic characteristics used in the initial study. We coded students not only by whether they took a distance learning section, but also by the instructional mode of DL course (videotape, televised interactive, web-based, CD-ROM, audio, or print-based). Some of these subcategories had very small Ns. Since there was no intent in this part of the study to look at individual courses, the total group was unduplicated at the outset; thus, the two groups have identical Ns (651). There was an interest in looking specifically at web-based courses since Sinclair's recently opened Center for Interactive Learning (CIL) and is developing and marketing web-based courses and programs on a much grander scale.

First, we looked for differences in course performance. An ANOVA was run between regular section students, students in computer-based distance learning, and students in all other modes of distance learning. We found a significant difference between the mean grade earned, with (non web-based) distance learning students having a lower mean course grade. Students in web-based sections performed only slightly better than the other distance learners.

Table 3 *ANOVA (Course Grade)*

ANOVA			All		
df	F	Eta^2 (η^2)	Courses	N	Mean
2	12.807***	.024	Web-based	51	2.2549
			Other DL	434	2.2488
			Traditional	546	2.6630

Note. The students were not 'paired' in this analysis; and only students with calculable grades were included.

Table 4 *Post Hoc Tests—**LSD***

All Courses		Mean Diff
Web-Based	Traditional	-.4081*
	Other DL	.0065
Other DL	Web-Based	-.0065
	Traditional	-.4142***
Traditional	Web-Based	.4081*
	Other DL	.4142***

Since the number of students in web-based sections was very small in comparison to the other groups, we also selected only the students who had completed any section of a course that also had a web-based

section. An ANOVA of this sub-group yielded different results, with the students in the web-based sections notably the poorest performers; and students in all other distance learning sections earned a higher mean course grade than the students in traditional sections.

Table 5 *ANOVA (Course Grade)*

ANOVA			Courses w/ DL section	N	Mean
df	F	Eta^2 (η^2)			
2	4.049*	.045	Web-based	51	2.2549
			Other DL	26	3.000
			Traditional	98	2.8571

Table 6 *Post Hoc Tests—**LSD***

Courses w/DL section		Mean Diff
Web-Based	Traditional	-.6022*
	Other DL	-.7451*
Other DL	Web-Based	.7451*
	Traditional	.1429
Traditional	Web-Based	.6022*
	Other DL	-.1429

Lastly, a t-test was calculated to determine the magnitude of the difference in the mean grade achieved by distance learners and traditional students. The mean course grade of all distance learners was 2.24, compared to 2.70 for the students who attended on-campus.

Table 7 *Paired Samples t-test (GPA)*

					95% Confidence Interval	
N	df	t	ES	Mean Diff	Lower	Upper
425	424	-5.681***	.167**	-.46	-.6239	-.3032

The criteria for "success" were the same as in the initial study—earning a grade of A, B, or C. Again, students in traditional sections were more likely to be successful than distance learning students. Fifty-five percent of the distance learning students passed their course and 70% of students in traditional sections passed. Overall, 36% of distance learners achieved a grade of "A" or "B", compared to 55% of traditional learners. The difference in withdrawal rate was not so striking: 21% of distance learners left a course with a "W" and 15% of traditional section students did the same.

Persistence to the following term mirrored results seen in the initial part of the study. Overall, 71% of the students enrolled the next quarter and 15% of those students took a distance learning course. The students who enrolled in a distance learning course the next quarter were overwhelmingly comprised of those who had a DL course the previous term. Results imparted that a larger proportion of continuing students elected to take a distance learning course section than was true for the Fall 1996 group.

Table 8 *Chi-square tests (N=1,302)*

Behavior Measured	Distance-Learner	Traditional Student	Chi-square (χ^2)	Lambda (λ)[1]	Phi (Φ)
SUCCESS (A-C)	54.7%	70.4%	34.101***	.026***	-.162***
PERSISTENCE	64.5%	76.7%	23.086***	.018***	.133***
RE-ENROLL DL	26.9%	5.6%	79.609***	.087***	-.294***

[1] based on Goodman-Kruskal measure of predictability

The final analyses undertaken were conducted within the group comprised only of distance learners. Do differences exist between performance and persistence based upon the mode of distance learning? The answer is a resounding YES.

Four categories of distance learning were considered: videocassette (take home), televised interactive, web-based, and audio. Print-based and CD-ROM sections were eliminated due to very small Ns (2 and 1, respectively). Students utilizing take-home videocassettes earned the lowest mean GPA (2.04) and students in televised, interactive courses achieved the highest mean GPA (2.73). There was also a significant difference in the distribution of letter grades, and a degree of association was found to exist between mode of distance learning and letter grade earned. Significant mean differences existed between televised, interactive sections and take-home videos ($p<.001$). Televised, interactive sections and web-based sections also differed significantly ($p<.05$).

Table 9 *ANOVA (GPA)*

ANOVA			Distance Learning Mode	N	Mean
df	F	Eta^2 (η^2)			
3	6.961***	.042	Take-home Video	280	2.04
			Web-Based	52	2.21
			Audio	43	2.44
			Live Interactive	110	2.73

Following from the ANOVA results, students in televised, interactive sections were most likely to earn an "A" and least likely to withdrawal from the course, while the students who had take-home videos were least likely to get an "A" and most likely to withdraw from the course—although withdrawal rates were similar for web-based and audio sections. Students in web-based sections were most likely to earn an "F" (χ^2 = 64.595, p<.000, λ=.012, Φ=.316).

Even though the students who utilized take-home videocassettes were least likely to earn an "A", students from web-based sections had the lowest success rate. However, these students from web-based sections were the most likely to persist, but least likely to do so in a distance learning course section.

Table 10 *Chi-square tests*

N = 648	Video	Web-Based	Audio	Interactive	Chi-square (χ^2)	Lambda (λ)[1]	Phi (Φ)
SUCCESS (A-C)	49.7%	48.0%	57.1%	72.6%	22.737***	.035***	.187***
PERSISTENCE	33.5%	48.0%	19.6%	39.3%	12.786**	.020**	.140**
RE-ENROLL DL	20.2%	16.0%	16.1%	18.3%	1.110	.002	.043

[1] based on Goodman-Kruskal measure of predictability

Conclusions

Performance and persistence did not differ much between the two phases of this study. We found that distance learners earned a lower course GPA and were less likely to be "successful" in the course. The measures of persistence implied that distance learning students were less likely to persist to the following quarter but that those who did reenroll were more likely to take another distance learning course than were students from traditional sections. We also found striking differences between student performance and persistence based on the mode of distance learning. One can surmise that the more structured nature and real-time exchange of the televised, interactive sections contributed to student

success; and, conversely, the very independent nature and lack of interchange inherent in the take-home video sections inhibited successful completion. It is interesting that the students from web-based sections had the worst success rate, yet the best persistence rate.

This study was undertaken as a matched pairs design, so any analyses of student demographic characteristics would have been irrelevant. The findings, however, lead us to believe that a broader analysis of the students is warranted. Differences in performance and persistence are seemingly due only in part to the type of course section (DL/not DL). We must now address the question of why students in distance learning sections do not perform or persist on par with the traditional learner.

The results raise suspicions that the distance learner is, indeed, a different breed. We controlled for the basic demographic characteristics that might contribute to differences between students' performance and persistence, as well as incongruities in course content. Still, our results suggested that neither success, grade earned, nor persistence to the following term could be prognosticated solely on the basis of a student's status as a distance learner. So we must now explore just how the nature and attitude of the distance learner does differ from that of the traditional learner. What factors are affecting the success of Sinclair's distance learner? What can we do better to support the distance learner? Why do students elect to enroll in a distance learning section in the first place...is it for the convenience and independence, or is it just to try something different? Additionally, we need to know if there are students at Sinclair who are pursuing a degree program solely via distance learning and how they perform compared to students who merely "dabble" in distance learning.

We can hypothesize that the student who enrolls in a distance learning section is more apt to be juggling the responsibilities of job and family. Is it these responsibilities that are affecting persistence and performance? Or, is it that the design of Sinclair's distance learning courses does not adequately meet the demands and needs of these students? Are the instructors adequately prepared to address the issues facing the distance learner? And, how comfortable are the instructors with this mode of instruction?

Regarding the persistence issue, we must be able to ascertain whether the student has the intent to persist or if the student just wants a convenient way to take a course (or two) for career development or personal interest. Do distance learning students seek out avenues of student support and, if they do, what

impact does that have on persistence? Finally, we must learn about student satisfaction with distance learning.

We have learned that, at least at Sinclair Community College, there is a difference between the effectiveness of distance learning and traditional course sections when examined in the limited scope of student performance and persistence. Obviously there are innumerable variables at play here, the interaction and interrelationships of which are having a measurable impact on the effectiveness of distance learning at Sinclair. In addition to more in-depth research of distance learning courses in general, it is apparent that we need to understand why there is such a difference in performance and persistence related to the modes of distance learning. Perhaps we will determine that our students will be better served by a synergy of technologies; or perhaps there is a need to gear particular modes of distance learning to particular groups of learners. This study has confirmed that there is much to learn and discover.

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