An alternative system of course delivery, wholly online computer-managed instruction, was evaluated to estimate its contribution to total full-time-equivalent (FTE) students two years after its implementation at Christopher Newport University (Virginia). CNU ONLINE offers eight online courses and one online degree program. In Spring 1997, nearly 500 students were pursuing studies in 34 offerings through CNU ONLINE. Online students completed a survey eliciting their reasons for online enrollment and whether those reasons precluded taking the classroom equivalent. Most frequent student reasons for taking online course work included a preference for online media; interaction with online colleagues; development of online skills; reduced travel expenses; and reduced travel time. Other analyses examined the campus-wide relationship between course load and commuting distance from campus, comparing pre- and post-implementation semesters. Results supported the hypothesis of a net FTE gain, as opposed to FTE redistribution. The results suggest the potential of online instruction to reduce negative effects of distance and scheduling. The survey is appended. (Contains 12 references.)
Evaluating the Impact of On-line Course Enrollments on FTEs
at an Urban University

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Jean Endo
Editor
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Evaluating the Impact of On-line Course Enrollments on FTEs at an Urban University

ABSTRACT

An alternative system of course delivery, wholly on-line computer-managed instruction, was evaluated to estimate its contribution to total FTE students two years after its start. On-line students completed a "Survey of On-line Enrollment Reasons" which elicited their reasons for on-line enrollment and whether those reasons precluded taking the classroom equivalent. Other analyses examined the campus-wide relationship between course load and commuting distance from campus, comparing pre- and post-implementation semesters. Results supported the hypothesis of current net FTE gain, as opposed to FTE redistribution. Because of this research, the potential of on-line instruction to reduce negative distance and scheduling effects appeared in a new light.
Evaluating the Impact of On-line Course Enrollments on FTEs at an Urban University

INTRODUCTION

CNU ONLINE is an on-line computer-managed system of course delivery that began over two years ago through special state funding. The early rationale urged the use of a bulletin-board message system for wholly on-line student-to-teacher and student-to-student interactions. A system of pedagogy evolved while assessment showed learning comparable to classroom learning and equivalent course rigor (Durel, 1995; Ridley, Miller & Williams, 1996; Ridley, Williams, Miller & Teschner, 1996; Williams, Teschner & Miller, 1995; Vachris, 1996). (Related research reports findings consistent with CNU's: Cartwright, 1993; Gilbert, 1997). Through this system, eight on-line courses and one on-line degree program began in fall, 1994 with slightly over 100 students enrolled. In the latest semester, spring 1997, just under 500 students (just under 700 enrollments) pursued studies in 34 offerings; expansion to other wholly on-line degrees is under discussion.

This expansion occurred during a period of intense debate and experimentation. Several issues and concerns remain current. One concern faced early was whether mastering the technology presented too much of an obstacle for many students. These concerns abated with an upgrade last fall to a more user-friendly full graphic user interface system (Richards & Ridley, 1997). (A separate appendix presents a thorough description of the system.)
The change was associated with improved student satisfaction, faster system learning curves, and a decreasing rate of withdrawal. However, even with this progress an important issue remaining was the problem studied in this paper. This problem was whether the student FTEs generated by ONLINE enrollments represented a true net FTE gain versus redistribution of FTEs between ONLINE and on-campus courses.

Purpose and Background

The purpose of the studies reported in this paper was to estimate the net impact of ONLINE on FTEs at an urban, predominantly commuter institution. Furthermore, a new administration's concerns that ONLINE was merely "stealing students" who would otherwise enroll on-campus created an immediate need for relevant data. In contrast to other forms of distance learning, ONLINE had the potential to truly obliterate distance electronically. That expectation was unfulfilled since by far most of the student clientele remained primarily students from the traditional service area--roughly a 50-mile commuting radius. However, the administration recognized the possibility that ONLINE allowed many students to enroll who would not otherwise have done so or who would have taken fewer credit hours. Therefore, the current study was done.

DATA SOURCES AND METHODS

Data sources were threefold: (1) an on-line "Survey of Online Enrollment Reasons" administered to all students in the on-line Philosophy and Government classes (most offerings); (2) on-
line patterns of course-taking before and after the first enrollment; (3) an examination of the campus-wide relationship between commuting distance and credits taken before and after the ONLINE program began.

Each method covered a different aspect of the problem. The first method asked students to report which of a variety of reasons might account for their current on-line enrollment as opposed to their taking the equivalent on-campus course. The second method suggested that ONLINE had eased enrollment for students, which would appear in enrollment changes during the period in question. The third method argued that, even lacking many distant learners, perhaps ONLINE measurably influenced how distance and credits correlated (if they were correlated). Further details and rationales for each method appear below.

Method 1: Rationale and Description

A "Survey of On-line Enrollment Reasons" assessed the variety of reasons a student might have for enrolling in an on-line course rather than take an equivalent classroom-based course. Reasons given are not necessarily mutually exclusive but can be found in different combinations; thus the survey instructions were to check all that applied. Opportunity for free response also appeared at the end of the survey. The survey developed from brainstorming and revising in light of student, faculty, and administrator reviews. The full survey appears as an appendix to this paper (Appendix 1).
Since students were in Philosophy and/or Government courses through CNU ONLINE, the survey was conducted on-line. A few days before sending the survey, the principal researcher sent an on-line message to every student in the target courses requesting their participation. Instructors and administration had been contacted earlier and endorsed the study. An electronic copy arrived in each subject's individual CNU ONLINE mailbox so that he/she would encounter a mail flag upon logging in. The survey invited students to respond simply with a "y" or "n" for yes or no to each question and send the message back to the sender. Subsequently non-respondents received two reminders. The final response rate was 61 percent.

Method 2: Rationale and Description

The second method began with a simple premise. Assume that ONLINE provided benefits to students affecting their ability and inclination to enroll in CNU courses. There should be a statistically significant tendency for the number of credit hours (attempted and earned) to rise after the first on-line course. Furthermore, it ought to be possible to estimate the amount of gain, percentage-wise, in the average credits attempted and earned, when comparing pre- and post-on-line enrollments.

A further analysis added another twist to the approach. That is, even if there is only a small mean credit hour gain over the entire sample of on-line students, the amount of gain might interact with the reasons students give for their on-line enrollments. For example, some reasons given might suggest the
student had little choice except to take an on-line course or else forgo any possibility of taking the course or courses. Reasons such as these (called here "preclusive" reasons) might predict a stronger gain in enrollments for those students who cite them.

Method 3: Rationale and Description

The third method argued that, even lacking many distant learners, perhaps ONLINE influenced how distance and credits correlated.

Based on preliminary data, the average distance of CNU ONLINE students from campus was disappointing considering the potential of the technology to obliterate distance. The vast majority, like the student population as a whole, reside in the traditional service area within a reasonable driving distance of about 50 miles from campus. However, that fact does not eliminate the possibility that the ONLINE system has altered the relationship between distance and credits earned. Distance is a continuous variable. Therefore, whatever its effects on student enrollments, they might be found even at moderate or short distances.

Even within commuting distance, distance might influence enrollments in ways such as the following. (A) Students who drive farther might favor enrolling at institutions closer to their homes. (B) These students might consolidate courses into fewer days per week to reduce travel; failing that, they might withdraw or defer enrolling until a later time. Both possibilities suggested reduced enrollments as a function of distance. CNU ONLINE provides another possibility--maintaining credits despite
distance. Therefore, if there is any relationship between
distance and credits over the whole student population, over time
the addition of the on-line option should have flattened that
relationship. As more students discovered they could maintain
enrollments without regard to distance, the correlation should
have weakened and distance should have reduced whatever value it
had in enrollment prediction.

From both fall 1994 and fall 1996 semesters, random lists of
200 commuting students were selected. For a predominantly
commuting institution, the restriction to commuting students is a
weak restriction. Let "commuting student" refer to any non-
residential student whose home was no more than fifty miles from
campus. A small residential population (less than 5 percent in
1994 and less than 10 percent two years later) was excluded.
Similarly, students living over fifty miles away were not
included. The numbers passed over were small on both counts.

Distances from homes to campus were estimated using street
and local area maps. Estimates of distance derived from scale
distances along major routes, using central points in each zip
code area. This method easily extracted distances from files
sorted by zip code. The method applied equally to most addresses,
including rural box numbers and street addresses. It was also
replicable and highly reliable.
RESULTS

Method 1: Survey Results

A. Enrollment Patterns

Sixty-one percent of survey (129) returned completed. An analysis of the responses explored the most common patterns among reasons given using principal components analysis.

The first four components to emerge in the analysis accounted for exactly 50% of the total variance. A "scree" test suggested limiting the discussion to the first four since the others were much less likely to be meaningful (Cattell, 1966; Grimm & Yarnold, 1995). To anticipate the results of the analysis, three of the four principal components were meaningful and interpretable. One principal component (the third one to emerge according to size of eigenvalue) was an artifact. Further explanation appears below.

For each of the four principal components the following procedures produced the interpretation. First, items with the largest eigenvectors on each principal component, and their intercorrelations, were examined. Second, individual respondents were identified who responded "yes" to all or most of these items. These respondents were designated "exemplars" of the principal component. If these students had written comments, they also helped interpret the principal components. Finally, internal review among the authors produced some consensus.
The first component appeared to tap an established preference for on-line courses and the on-line medium. Let us call this the "Veteran On-line" pattern. The following items were most strongly weighted on the component; they appear below in descending order of eigenvectors, shown in parentheses:

11. **Preference for On-line**: I have tried other on-line courses, and I generally prefer to use this medium for learning. (.45)

8. **On-line Colleagues**: In taking several courses on-line, I have found some "on-line colleagues" who are both helpful and fun to associate with on-line. (.43)

9. **On-line Skills**: I have become accustomed to on-line courses and have gained the computer skills that will help me do well in the on-line course. (.39)

3. **Expenses**: I am taking this course on-line so that I can save the money that I would otherwise spend on transportation. (.37)

2. **Distance**: I live too far away from campus to drive there for the scheduled on-campus course. (This reason may include: I already drive a lot during the week and need a break.) (.35)

The first three items suggest the respondent had become adapted to and comfortable with on-line courses. The last two items provide a minor theme. Perhaps many students first became attracted to on-line courses because it helped them overcome distance, time, and cost factors. Later, benefits of on-line
enrollments made a larger impact. Item number 8, On-line Colleagues, reminds us that interaction with other students on-line helps overcome early concerns about on-line.

Two quotes from exemplars illustrate the "preference" theme:

1. "I think that on-line is a great way to learn! ...This on-line system gives you interaction with students as well as interaction with the professor and it is extremely flexible. I don't know what I would do without it."

2. "...I am grateful for CNU Online and the opportunities it has given me. Secondly, this system is absolutely, positively, user friendly..."

Two other students illustrated the distance reason. One had to move out of the area and found CNU ONLINE the only way she could continue at CNU. Similarly, another student who lives 150 miles away wrote that she "...would not be able to take a class there were it not for Online classes."

The second component described a pattern here labeled "Schedule Convenience." This component was most strongly indicated by two items (again, eigenvectors appear in parentheses):

(13) **Time Allotted**: I have chosen the on-line course because I don't have enough time to take the classroom version. (.53)

(15) **Work Schedule**: My work schedule does not permit me to take this course in its classroom form at the times
Students who illustrated this pattern did not necessarily select an on-line class because they preferred that medium. They got started on a particular on-line course or courses because it was the only way to make progress. Here are four quotes that illustrate this pattern:

1. "I am in the Air Force fire department and work 24 hr. shifts every other day, so it would be extremely difficult to get to campus for classes."
2. "...It is very difficult for me to attend class at night so I have chosen to get my requirements out of the way in a more time efficient manner."
3. "A course I had originally registered for was cancelled...It happened to be an 8:00 class, which was the only hour which fit my work schedule...On-line was my only other option."
4. "...My husband's work hours vary week to week. I am online to add more flexibility to our personal time. If I attended classes physically, I probably would not seem him very much."

The third meaningful principal component was a little more difficult to interpret. Tentatively, this component is called the "Novelty" family of reasons for taking on-line courses. Students giving these reasons are newcomers lacking devotion to the on-line medium. They were willing to try it out as an experiment. Three items stood out in relation to this factor:
(4) **Experimentation**: I have not taken an on-line course before, and I would like to give it a try in this course. (.60)

(7) **Lifestyle Preference**: I am taking the class on-line because it fits better with my preferred lifestyle (e.g., sleep, study, or recreation habits). (.45)

(11) **Preference for On-line**: I have tried other on-line courses, and I generally prefer to use this medium for learning. (-.32--note the negative weight)

What made this component difficult to interpret was that these items do not form a tight cluster (except that 4 and 11 are negatively related). Perhaps newcomer students take their first course for a variety of reasons, but they have in common a reasonable open-mindedness toward the experience. Attraction to computers often forms part of the pattern. Here are four illustrative quotes.

1. "...I enjoy working on the computer, so I thought I'd give this a try. So far, I'm enjoying it very much."
2. "My main reason is that I have a strong interest in computers. I wanted to see how I would like working in an on-line environment for a class..."
3. "...I thought it would be interesting and different and if I like it I will take more."
4. "...I basically wanted to try something new, as I said before. I always heard about how the future would allow students to go to school through a computer when I was
younger, but never thought it would happen...it fascinates me that this actually happened."

It is tempting to see the three components in a time continuum. Both negative (avoidant) and positive (attractive) variables influence the initial enrollment. Then many students opt to take an on-line course because they need it to overcome obstacles, particularly time and scheduling problems. Some students may be attracted by the novelty and the fascination of working with and through computers. After some experience with on-line classes, these same initial factors continue but (for those who persist) new factors enter. Students have met and worked with helpful and friendly "on-line colleagues" who eased their way into the world of on-line learning. Students' familiarity with the system has improved and their skills have sharpened. In the end, many of these students positively prefer the on-line learning environment.

The principal components also appeared to show a fourth component that, upon further examination, was an artifact. However, it is instructive to examine this result as a reminder of important future applications that might broaden the on-line user base. The other "component" revealed two related items: "Restriction of Movement: I have chosen the on-line course because of a physical disability" and "Transportation Access: I do not have access to a reliable car or other transportation to take the classroom version of the course." Initially, this looked like a "Disability" component. However, the correlation between the two
items (.44) occurred primarily because the overwhelming majority responded that neither reason applied to them. Only two individuals responded that BOTH applied to them. The base rates of those who called themselves "disabled" were extremely small (6) in this sample. For those few individuals the "restriction of movement" reason (and the other family of disabilities) are legitimate reasons—maybe even the most important ones for certain individuals. This reminds us of a largely unexplored field of application as far as CNU ONLINE is concerned.

The following table summarizes the four patterns discussed above and the primary characteristics of each.

**Table 1: Principal Components and Their Descriptions**

<table>
<thead>
<tr>
<th>Principal Component No.:</th>
<th>Primary Characteristics:</th>
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<tbody>
<tr>
<td>1. Veteran On-Line</td>
<td>Comfortable with on-line courses; often prefer them.</td>
</tr>
<tr>
<td>2. Schedule Convenience</td>
<td>On-line courses remove schedule-related obstacles to enrollment.</td>
</tr>
<tr>
<td>3. Novelty</td>
<td>Willing to give on-line courses a try; often attracted to computers.</td>
</tr>
</tbody>
</table>

Other reasons for on-line enrollment did not figure in the correlation analysis. Several items were chosen very rarely as reasons for on-line enrollment. As noted earlier, "Restriction of Movement" (physical or other disability), and "Transportation
"Access" were not strong reasons for enrollment. Other reasons were "Family Care" (the need to care for dependent family members) and "Home Business" (staying at home to take care of a business). In addition to rarely chosen items, another reason that was unrelated to the above patterns was "Degree Progress." Although over half the students cited this reason, it was chosen frequently by the members of all the various clusters identified above; thus it interacts with different enrollment patterns and does not correlate strongly with any.

Method 2: Enrollment Patterns Associated With Reasons

The second method examined whether having an on-line experience increased the number of credits students were taking the semester before enrolling in their first on-line course. Of the respondents, those who had no records of enrollment before their first on-line course or courses were eliminated from the analysis. In addition, a few withdrew from the on-line course after taking the survey. There were 69 students remaining. Of these 69, 44 attempted more credits in the current semester than they attempted in the semester before their first on-line course. Just 12 attempted fewer credits than before their first on-line experience. Finally, 13 took the same number in both semesters. Thus, 57 out of 69 (83 percent) attempted the same number of credit hours or more since their first on-line experience. This result is clearly highly significant.

A high percent (approximately 80%) identified reasons which conceived as precluding their enrollment in the classroom.
equivalent. (The authors' consensus validated these judgments.) These reasons include: work schedule conflicts, other schedule conflicts, family responsibilities, and several others. Other non-preclusive reasons included "life-style preferences" such as eating, sleeping and recreation schedules, cited by around 70% of respondents.

The data reported above afford a rough estimate of how much students have gained in their attempted and earned credits before and after ONLINE. The 44 who attempted more credits increased their number of credits by 217. The 12 students who attempted fewer credits decreased by 42. The net gain was thus 175; spread over 69 the net mean gain in credits attempted was 2.54 or approximately 21 percent of a full-time load. Not all of that increase is due to on-line credits for these students. Further study must test this result and refine its accuracy.

A hypothesis that on-line enrollment reasons interact with enrollment patterns has been examined but has not been, at this writing, clearly demonstrated.

**Method 3: Correlational Analysis: Commuting Distance and Credit Hours Before and After the On-line Program**

The results for the third method were as follows. Correlations between credits earned or attempted and commuting distances in miles were calculated for both semesters. (Correlations involving credits earned and distance are reported; credits earned and attempted are so highly correlated (.89-.93) that the distinction makes no practical difference.) In 1994 the
correlation coefficient was -.07; in 1996 it was .11. Neither correlation was significant.

This method found no impact of ONLINE on this measure since the premise of the measure was mistaken. Correlations between one-way commuting distances and credits taken were not statistically different from zero.

CONCLUSIONS AND IMPLICATIONS

The studies described above have met the initial administrative need for relevant data on the central issue raised. They confirmed that net FTE gain can accrue even when students overwhelmingly commute from inside the traditional service area. The role of distance in this context appears complex, although theoretically ONLINE can obliterate distance as it does for the few who live 200, 350 or 2000 miles away. The study as a whole is more revealing on the effects of ONLINE on time use; other research confirms that time flexibility is among the strongest perceived advantages (Kenyon, 1997). Since the technology removes the need for set teaching or meeting schedules, ONLINE offers students a tool for fitting more educational and degree progress into their busy lives.

This study has informed both researchers and administrators in their quest to make CNU ONLINE an ongoing success. Expectations regarding the program are not what they were at the outset; greater numbers of distant learners were anticipated. In addition, program planners expected students having various forms of disability to enroll in greater numbers. This research has
clearly shown how even when administrative predictions fall short, new and unexpected but more realistic indicators of success can emerge. Our university should continue to pursue using on-line courses to serve students who live far away from the campus or the disabled. However, clearly a path of great opportunity lies ahead. On-line instruction can help us better serve those students whom we have always served—those from the traditional service area within commuting distance. The working spouses who abandoned college aspirations years ago; the former college students who postponed their studies to work and raise families; those who must work irregular schedules—all of these are potential students who may not have realized the benefits of on-line education. Through this research, the simple idea of studying the reasons behind enrollments played a key role in changing the way we think about on-line enrollments.
REFERENCES


NOTE: See also the March/April 1995 and March/April 1996 issues of Change for a general introduction to teaching and learning technology in higher education.
APPENDIX 1: Survey of Online Enrollment Reasons

To: All Online Government/Public Affairs and Philosophy Students
From: Dennis Ridley, Ph. D., University Assessment Officer
Date: August 29, 1996

With the support of the Departments of Philosophy/Religious Studies and Government/Public Affairs and instructors, the following survey was prepared. It was designed to provide extremely important information for the administration of CNU ONLINE. Please take a few minutes and give the following your careful attention and response.

In order to respond to this survey select "message" on the title bar and then select "reply with quote". This will provide an easy way for you to respond to each question presented. Your responses will automatically be sent to me.

The survey lists a number of possible reasons why you might have chosen to enroll in this course in the online format this semester. (The reasons are merely listed in alphabetical order.) Indicate "yes" (or "Y") for every reason that applies to you. Indicate "no" (or "N") if a reason does not apply to you. Respond to as many of the reasons which are relevant. Finally, if there are any relevant reasons that you do not find listed, please write out that reason or reasons in the space provided at the end.

Special note for students enrolled in more than one online course in Government/Public affairs or Philosophy: If you are enrolled in more than one online
course, this survey will appear more than once. If so, please disregard the additional surveys (only complete the survey once).

Survey of Online Enrollment Reasons

1. Degree progress: I find I can make faster progress toward my degree by taking courses online.

2. Distance: I live too far away from campus to drive there for the scheduled on-campus course. (This reason may include: I already drive a lot during the week and need a break.)

3. Expenses: I am taking this course online so that I can save the money that I would otherwise spend on transportation.

4. Experimentation: I have not taken an online course before, and I would like to give it a try in this course.

5. Family care: I am taking this class online because I must be at home to care for a member or members of my family.

6. Home business: I need to take the class online so that I can help manage a home-based business. (This could include working at home for someone else.)

7. Lifestyle preference: I am taking the class online because it fits better with my preferred lifestyle (e.g., sleep, study, or recreation habits).

8. Online colleagues: In taking several courses online, I have found some "online colleagues" who are both helpful and fun to associate with online.

9. Online skills: I have become accustomed to online courses and have gained the computer skills which will help me do well in the online course.
10. Other responsibilities: Other activities (not work or family) conflict with the classroom course (e.g., volunteer work or clubs).

11. Preference for online: I have tried other online courses, and I generally prefer to use this medium for learning.

12. Restriction of movement: I have chosen the online course because of a physical disability.

13. Time allotted: I am taking the class online because I don't have enough time to take the classroom version.

14. Transportation access: I do not have access to a reliable car or other transportation to take the classroom version of the course. (This reason may include lack of a driver's license.)

15. Work schedule: My work schedule does not permit me to take this course in its classroom form at the times offered.

OTHER REASONS. Use the following space to list any other relevant reasons you enrolled in this course Online.

16. Approximately how many miles (one way) do you live from CNU?

17. Are you a member of the United States Military?

18. How many credit hours are you taking online this semester?

THANK YOU FOR YOUR ASSISTANCE.
NOTICE

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