For an Online Course Encompassing “Traditional Campus Students”: How, Where, And When Students Work And Engage With The Course Material

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Abstract - The data presented here reveal how traditional college students cope with a totally online class experience. The largest enrollment online course at The Pennsylvania State University is the general education offering “Energy & the Environment”, developed jointly by the Department of Energy & Geo-Environmental Engineering and the John A. Dutton e-Education Institute. Within the first 2-years >1,000 students (mostly on-campus residential students) have been engaged, online. Students work independently or in self-forming cohorts reading text, listening to audio, watching movie clips, and interacting with imagery or simulations online. The majority of students fit the traditional profile in terms of age and on-campus residential status. The class is consistently 60% male. The students are predominantly sophomores (41%), although all academic standings are present within this general education course. One of the main reasons given for enrolling is “flexibility.” Roughly half of the student activity (56%) is after the traditional workday of 8 AM to 5:00 PM. Only 10% of the online activity occurs within the traditional morning hours. In a class with weekly Friday evening deadlines, there was little activity (measured by number of page requests) occurring on Saturday (5%), Friday has the bulk of the activity (27%). About 72% of the students accessed the material from home with a high-speed connection. About 17% did the bulk of their work at a computing laboratory, despite the fact that 96% of the class has a personal computer. While the students gained content specific knowledge, they also learned “self-discipline” and other “professional” behavior, and had exposure to online learning and course management software.

Index Terms - online classes, student behavior online, web courses.

INTRODUCTION

Penn State is experiencing the same increase in online enrollment as many of our peer institutions. Distance education online serves a broad cross section of learners, from traditional college-age students in residence at university campuses to mid-career adult professionals who need to study from home or at work. Although traditional students may be physically closer, they present special challenges, especially in terms of study habits. This sub classification of distance education student is substantially different than the working professional. How, where, and when students choose to interact with course material in a general education class: Energy & the Environment (EGEE 101), is the subject of this paper. It is expected that this information will assist in preparing student support facilities and peak workload predictions, and also serve to temper faculty expectations of workload. In the future we plan to link student behavior with degrees of success in this online environment.

COURSE DESCRIPTION

The class was created as a collaborative effort between the Department of Energy & Geo-Environmental Engineering and the John A. Dutton e-Education Institute, both being in the College of Earth & Mineral Sciences at the Pennsylvania State University. The online class represents about a person year of effort, and has succeeded in producing an engaging experience through a rich inclusion of imagery, movies, audio, and interactive elements. More information on the approach taken is available elsewhere [1, 2]. It was one of the 16 WEB-designated (the entire class is conducted via the internet) general education classes taught in the spring of 2004 to resident students at Penn State’s University Park campus. This course has the highest enrollment: 330 students out of 1,788 initial online enrollments in general education WEB classes for spring of 2004. Currently at Penn State about 7% of students...
report that they have taken an online class [3]. The fact that 14 of the 16 general education online classes were full at the start of the semester, is an indication that students are beginning to seek online education, in significant numbers, despite the availability of many class taught via traditional methods. For example, students at University Park can choose from among 100 classes to satisfy their Natural Sciences General Education requirement. Only 4 online classes meet that requirement.

**THE STUDENT BODY**

In a class section containing 195 students (Fall 2003), 163 respondents indicated that 6% of that class was freshman, 40% sophomore, 31% junior, 21% senior, and 2% adult learners. The adult learners emanate from Penn State’s World Campus, which are added into the resident section when they are few in number (8 students). Sixteen percent of the students had taken a “web only” class previously. Thus for the bulk of the class, this was their first fully online class experience. This percentage is higher than that of the general student population (7% of students spread over 26 campus locations [3]). Only 3% of the students considered themselves to be inexperienced with computers. The majority (96%) own a functional computer. At the time of accessing one particular quiz, surprisingly 10% were using a telephone modem connection, 26% a dorm room connection, 47% a cable modem, and 17% from a PSU computer laboratory. Thus, 90% of the students were accessing the material via a high-speed connection. As the class is rich in multimedia, this is a significant issue. A CD-ROM is utilized to deliver the large media files to telephone modem users. Three quarters of the class were apprehensive because the material was online, which matches well with 74% not having experienced a web class previously. Half of the class expected to have part time employment during the semester with only 21% ruling out the possibility of part time employment. Thus, physical proximity (short cable) does not necessarily imply accessibility of classroom instruction. The class was not evenly split among males and females, with the web class being 60% male. A hybrid version of the class however was gender neutral. The student body at Penn State is 54% male [4], presumably because of sizable Colleges of Agricultural Sciences, and Engineering. Most U.S. universities have a larger female (56%) than male population [5].

**DATA COLLECTION**

The course is facilitated via the course management system that Penn State has adopted: ANGEL (A New Global Environment for Learning). Through this system, submissions and student activities within the course material can be followed. The bulk of the content for the course resides in an external server cluster and thus server logs can be utilized to track activity in detail. Quizzing is performed using external software (TestPilot), which permits the number of submissions, time allocated, and scores, to be recorded. Finally, student questionnaires were delivered via the ANGEL system during the first 2-weeks and last 2-weeks of the course.

**DATA AND DISCUSSION**

The course consists of three units covering: home energy use and electricity, transportation, and environmental challenges. There are exams in proctored rooms for 60% of the total grade. Students are also required to do three weekly activities: a “wakeup the brain” (a reflective paragraph or two on the subject), which unlocks the lesson content, a reflection (another two paragraph reflective discussion of the lesson content) and a quiz delivered via the TestPilot software. The reflective material is graded by teaching assistants, while the TestPilot quizzes are computer graded. The term “quiz” is misleading, as the intent of the exercise is to be an enhanced (directed) learning opportunity, linking the students to other sites and additional visual interpretations of the material. They can be accessed as often as desired with the highest score being recorded. The quiz randomly selects about 30 questions from a pool of 50 questions. The questions serve the role of reinforcing the important concepts and ensuring coverage of the material. For all of the graded material, the deadline is 11:59 PM on a Friday night (the items actually close to submissions at 4:00 AM Saturday morning to cover computing emergencies). The exception is the “wakeup the brain”, as this submission unlocks the lesson material. Only items submitted on time are graded.

Page requests, determined from server log data, sorted by day of request for the Fall 2003 semester are shown in Figure 1. The day with the least activity is Saturday with 5%, although it should be noted that this did coincide with football season. Sunday was less “quiet” with 14%. Two exams for this semester fell on Tuesdays, and one on Thursday. There was significant activity (accessing pages) in the days before and during the examination day (as the exams could be taken as late as 9:00 PM). These page requests are termed “exam-related.” The non-exam related accesses were: Monday 11%, Tuesday 13%, Wednesday 17%, Thursday 13%, with Friday being the busiest single day with 27% of the page requests prior to the deadline. The lead author may have influenced this pattern by sending out (often humorous) chastising emails to those yet to start the lesson material by Wednesday morning.

![TOTAL PAGE REQUESTS FOR THE FALL 2003 SEMESTER SHOWN BY DAY OF THE WEEK. DEADLINE FOR THE MATERIAL IS FRIDAY NIGHT 11:59 PM. UPPER COLUMN ITEMS SHOWN IN BLUE/LIGHT GRAY ARE EXAM RELATED REVISION ACCESSES FOR THE 3 EXAMS.](image)
During the first offering of the course, the faculty watched in quiet amazement as approximately 40% of the students attempted 2-weeks worth of work in a single day, the day of the deadline! Following that observation weekly deadlines were adopted for all lessons.

The time of day requests are shown in Figure 2, the data was extracted from server logs. Exam related revision activity has been excluded from the figure. There is little activity early in the morning hours of the day, only 10% of the page requests coming between 8:00 and 11:59 AM. The peak time of page requests are 3 PM in the afternoon. The traditional workday (8 to 5) accounts for 44% of the activity. There is a noticeable dip in page access during the dinner period, followed by a surge into the early evening with a tailing off into the late night. The activity from 6 PM to 12:59 AM accounts for 43% of the activity. Flexibility in accessing the material is often cited by the students as being one of the advantages of taking an online class. The range of times of the day that students are active would indicate that students are engaging with the material well into the evening hours.

Graham Spanier (Penn State’s president) has commented that a student-centered institution needs to accommodate the students not just the faculty and staff working 8 to 5 [6]. Web classes are one way to accommodate student needs, particularly among a student body that is increasingly seeking part time employment. Students are also shunning early morning classes. An increasing number of students taking this class are special case students struggling with additional responsibilities such as childcare issues. The fact that about half of the activity is during the day, when many of the students are on campus, indicates where students are accessing the class content. Survey results indicate that about 17% did the bulk of their work at a computing laboratory despite 96% of the class having a personal computer. University-wide data indicate that the rate of computer ownership among undergraduate students in 2003 was 95% [3]. For the “wakeup the brain” submissions, the majority of students accessed the material from their home computer (residence or dorm room). The same is true for the weekly TestPilot (computer based testing software) submissions. However, 21% of page requests come from Penn State computer labs, based on three lesson pages from a typical week. Thus, it appears that students are starting and finishing the work at home but accessing at least some of the content from computing facilities (excluding dorm rooms) in between resident instruction classes. In the fall class 26% of the students accessed the initial “Getting Started” material from a dorm room.

Accessing the class material from different computers can cause challenges. Fortunately, the necessary plugins are already installed in the PSU computing facilities including the non-standard plugins such as CHIME, which permits users to rotate and view structural representations of molecules within web pages. However, the audio and video delivery offers more of a challenge, given the absence of speakers on most laboratory computers. Successfully accessing audio components requires an mp3 player (not a problem) and headphones. In the pre-cell phone day’s headphones were ubiquitous (based on a personal observation of students between classes). With 67% of students having cell phones in 2002 [3], listening to music has been replaced by personal communication, so that audio access is again challenging.

When students choose to start the week’s work is also informative. Figure 3 shows the day (and time) for lesson 09 wake up the brain submission (start of the lesson—unlocks the lesson material), versus the overall grade in the course for a section in the Fall of 2003. Clearly those students who start earlier in the week have a higher probability of obtaining a higher grade, although it is also clear that some students can be successful by starting the lesson on the due date. Those students choosing to start this lesson on a Friday (the due date) had the lowest probability of obtaining an “A” grade: 21.3% of Friday submissions obtained an overall “A” grade for the semester. Figure 3 does not include those students who obtained an overall grade lower than 70%, which were 10 in number. No chastising email, reminding students to start the lesson, was sent the week these data were recorded. The average exam score data is presented in the same manner in Figure 4. A similar plot is observed but with greater scatter, as expected.
With a class that is rich in media and imagery, it is interesting to determine much of the material is printed. From the Fall 2003 survey results for one section (140 responses), it was determined that 21% of the students did not print any of the material, while 11% printed 100% of the material. The content contains in excess of 1,000 color images. Others have indicated that because students tend to print material, online classes should contain few images to be accommodating. This is an unimaginative approach when the combination of monitors, computers, speakers, keyboard, mouse offer much more enriching content and engagement than text and simple imagery. To bypass printing issues, some students choose to copy and paste the text into a text document that they print. While it is recognized that many students wish to have a paper copy, a surprisingly large number of students do not. Given the cognitive advantages of reaching and engaging multiple senses, no attempt has been made to ease printing difficulties. An alternative would be to use a textbook, but this would separate the multimedia experience from the text. Therefore, no textbooks were utilized in this course, even though for distance education the portability and accessibility of a book is unmatched.

The email communication data from student to instructor are shown in Figure 5. During the reported semester there were 200 students in the section with a total of 583 emails over the semester, for an average of 3 emails per student. Although incoming course email to the instructor averaged 5 inquiries per day (from this section of 200 students), Figure 4 reveals that email traffic was much greater on certain days. Monday was the busiest day with one single Monday accounting for 31 separate emails. The weekend had a lower level of email communication. This trend is surprisingly divergent from the trend of when students access the material (Figure 1). It should be noted that threaded discussions were utilized for course content questions (total posts were 354, 122 being replies from the instructor). Email was the communication format for course management issues such as grade issues and exam performance. With 33 graded items per student, thus totaling 6,600 grades, it should be no surprise that grade issues accounted for much of the communication. Thus, the pattern shown is influenced by the release of grades.
In a section of 333 students (spring 2004), 854 submissions were made to one of the weekly TestPilot computer graded quiz. The average number of submissions was 2.8 per student. Only student submissions are recorded, with questions being delivered one at a time with immediate feedback between questions. Some students, upon failing a question, choose to close the quiz window and restart the quiz. Some students were tenacious in obtaining the 100% score, with one student requiring 13 attempts, during 55 minutes of effort. Thirty eight percent required one submission taking an average of 8 minutes. It is permitted for the student to access the notes or any other electronic source in search of the answer(s). Eight percent of students required 6 or more attempts. Fifteen percent required 2 attempts (16 minutes on average for the combined time), 16% required 3 attempts (27 minutes), 13% required 4 attempts (30 minutes), and 9% required 5 attempts (36 minutes). Nearly all the class obtained 100% for these quizzes (enhanced (directed) learning opportunities). This particular quiz contains the fewest (20) questions.

When asked: “what did you (the student) gain by taking an online class?” the student’s responded with the expected “flexibility” but also time-management, and self-direction, terms that we interpret as “professionalism.” From one Fall section there was 136 responses to the question, and 46 respondents indicated that they gained time-management, responsibility, and self-motivation; 46 also indicated freedom/flexibility; 23 indicated content knowledge; 16 indicated course management system experience or technology experience; and 13 indicated learning style experiences such as “a new experience in learning.” Other quotes of note were: “I learned that online classes are just as much work, or more work than regular classes. Although you do get to miss class, more outside class work is required.” “Responsibility. More Reliable Time Management, Self-Discipline, Persistence, Self-reliability, I had to be extra "hardworking", since I was pretty much responsible for knowing the material for myself.” “The fact that I should start my work before the night before it's due.” “I learned how to be responsible and to prepare myself for how things are gonna (sic) be when I get a job and head out into the workforce.”

**CONCLUSIONS**

Distance education online via a very short cable is a reality for approximately 1,700 resident students enrolled in online courses at Penn State’s University Park campus each semester, and the enrollment is growing. In a course with weekly Friday night deadlines the students choose to access the material mostly in the afternoon and evening into the early morning hours. Fifty-six percent of the activity in accessing course material occurs outside of the traditional workday. The majority of students (90%) use a fast connection to access the material. The weekends have the least amount of activity with Friday (the day of the weekly deadlines) being the busiest day for accessing material. Students who started very early in the week perform better than those starting later in the week. Those students who choose to start on Fridays have the lowest rate of achieving an “A” grade in the course. Mondays had the bulk of the student initiated email contact with 27% of the total email activity. Much of the material was accessed from the students’ residence, particularly the entry and exit quiz material but surprisingly some was accessed from campus computing lab facilities, despite the fact that 96% of the students have their own personal computer. Half of the class expected to work part time during the semester, which helps to explain the strong desire for flexibility in accessing classes online, despite having many resident class offerings from which to choose. Students gained professional behavioral skills (self directed, time-management, responsibility) by taking the online class.

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