

AN ANALYSIS OF VARIATION IN TEACHING EFFORT ACROSS TASKS IN ONLINE AND TRADITIONAL COURSES

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Abstract: As the role of the internet and internet technologies continues to grow in pace with the rapid growth of online education, faculty activities and tasks are changing to adapt to this increase in web-based instruction. However, little measurable evidence exists to characterize the nature of the differences in teaching effort required for online versus traditional courses. This paper reports on the results of a quantitative study of instructor use of time which investigates not only total time expended, but also examines differences in types of effort. The basis of the study is a comparison of seven comparable pairs of online and traditional course sections where instructors recorded time spent during course instruction for the seven pairs. This paper discusses relevant related work, presents the study motivation and design, discusses how teaching effort varies across different tasks between online and traditional courses, and presents thoughts for future research. The results of this study indicate that instructors of online courses spend more time on direct interaction with students when compared to instructors of traditional courses, but spend less time on other activities such as grading and materials preparation.

1 INTRODUCTION

The use of the Internet as a distance education medium continues to grow and many institutions offer Internet courses using asynchronous, computer-based instruction. This growth is changing the faculty role and requires a shift in the expenditure of time as faculty teach online.

Few quantitative studies exist on faculty use and distribution of time when teaching online courses. A perceived increase in level of interactivity between faculty and students was observed by Hiltz and Turroff (Hiltz & Turroff, 2002), Young (Young, 2002), and Salmon (Salmon, 2002). Based on nineteen studies performed at NJIT, Hiltz and Turroff recommend that in order to build student confidence in an online course, faculty should be online frequently. In addition, Hiltz and Turroff emphasize the need for frequent interactions with students early in the semester to establish a foundation of trust, and also indicate that this structure of confidence should

be preserved and strengthened by maintaining a high level of interaction throughout the semester.

Young (Young, 2002) comments on the changes required by faculty when e-teaching in order to meet students' expectations of immediate response to questions and requests for interaction. In fact, this increased pattern of interaction is reinforced by the structure imposed by some academic institutions that requires instructors to respond to student email or bulletin board postings within 24-48 hours. Indeed, in her keynote address to the 2002 EduCAT Summit, Dr. Gilly Salmon (Salmon, 2002) emphasized that the use of time in online courses is more flexible than in courses taught in a traditional mode and that instructors of online courses should expect to adapt their schedules to the online mode of education. Other researchers have also noted increased interactivity in online courses (Hislop & Atwood, 2000; Hartman, Dziuban & Moskal, 2000; Schifter, 2000a; Schifter, 2000b).

The major drawback to the studies discussed above is the use of a survey or interview-based approach that relies on faculty opinions and

observations rather than measurable data. The most useful research on faculty time spent on various teaching tasks for online and traditional courses come from studies in which faculty measured time spent on various activities required to deliver an online course. DiBiase (DiBiase, 2000) investigated the time spent on various activity categories in teaching two similar geography courses, one taught online and the other taught using a traditional, face-to-face format. However, while DiBiase normalized the total time figure on a per student basis to provide an accurate picture of the total amount of time required to teach online and traditional courses, the study did not present normalized figures for the task categories, making it difficult to clearly ascertain the difference in effort expended across tasks between the two modes of delivery. Visser (Visser, 2002) performed a similar study of faculty effort using a more detailed categorization of tasks, but also did not normalize the time figures for task categories.

This paper reports on a study involving the detailed recording of instructor time in comparable online and traditional course sections to support a comparison of the distribution of faculty time over tasks between the two modes of delivery. Initial results of the study which indicate little significant difference between the total time required to teach online and traditional courses are reported in (Hislop, 2001) while details on the study environment and approach are provided in (Hislop & Ellis, 2004). This paper provides more detailed data on faculty time distribution across different teaching activities, using quantitative data to clarify how faculty time is used in teaching online courses.

2 STUDY APPROACH

In this study, participants categorized their teaching-related activities, providing a basis for investigating the nature and characteristics of how teaching effort varies between online and traditional courses. We know that when teaching an online course, the traditional face-to-face activities such as lecture and informal discussion with students will be replaced by online activities. But an analysis of effort distributed across specific activities will allow us to compare the amount of time taken by those replacement activities. We will also be able to look for changes in time spent on tasks common to the two delivery modes such as grading.

The study was conducted using seven pairs of comparable sections of graduate courses in information systems and software engineering taught in a U.S. institution. The typical student taking one of these courses was a technically savvy, full-time

working professional. All courses used in the study were mature courses and all factors of online sections of the course (e.g., class size maximums, course content, etc.) were designed to be as equivalent to the traditional sections as possible. The online classes were completely online and generally asynchronous, with the exception that some courses may have required students to attend weekly discussion at a prescribed time. The delivery platform was a custom application built using Lotus Notes and the courses were accessible over the Web using either a Notes client or a Web browser. (Hislop, 2000) contains additional information about the online environment.

This study measured teaching for pairs of sections of the same course, one taught online and one taught face-to-face, both taught by the same instructor. The sections were taught in the same or successive terms, and with no major changes in course materials between the two offerings. The instructors for the course sections were all experienced teachers and all sections were taught without the benefit of teaching assistants or other types of support. In order to ensure participation, instructors were paid for completing the logging task for a pair of course sections and time was only logged during the 11 weeks of the term in which the class section ran. Instructors logged their time using the following categories: Administration, Discussion, Email, Grading, Lecture, Materials, Other, Phone, Preparation, Talk, and Technology.

The study results reported in this paper attempt to provide a partial answer to the question of what differences exist in the types of faculty effort expended for online and traditional classes. In particular, the results reported in this paper attempt to address two main questions:

1. What are the differences in instructor time spent on various teaching tasks between online and traditional sections?
2. Within a particular mode of delivery, how does instructor time spent on specific tasks differ between more and less time-efficient instructors using that particular mode of delivery?

Section 3 provides a high-level summary of the total effort results and discusses each of these research questions in separate subsections.

3 DATA ANALYSIS AND RESULTS

The study produced complete time logs for seven pairs of course sections. As reported in (Hislop & Ellis, 2004) which describes the investigation into total effort and effort over time, the total time logged for online sections was 737 hours, and 814 hours

were logged for the traditional sections. The average size of the online classes was 19.3, while the traditional class' average was 26.0 and the average for the entire set was 22.6. These figures represent an approximately 25% difference in average class size between traditional and online sections. The commonly held assumption that teaching has economy of scale was supported by the findings in this study as when the total effort figures were normalized on a per student basis, the average number of hours spent per online student was 6.26, while 6.17 hours were spent per traditional student.

3.1 Task Differences

The categorization of time enumerated above provides a basis for a more in depth examination of how teaching effort varies across different tasks between online and traditional courses. An analysis of cataloged effort allows us to see what online activities replace the traditional face-to-face activities such as lecture and informal discussion, as well as allowing us to look for differences in time spent on tasks common to the two delivery modes such as grading.

Since a commonly held opinion is that e-teaching requires an increased level of interactivity between instructor and student, we generally grouped the activity categories based on their interactivity requirements. The activity by category (normalized per student) is presented in Tables 1 and 2, where Table 1 contains all the activities that involve interaction between the instructor and students, and Table 2 contains all the activities that do not involve student interaction. We can begin with a general observation that several of the categories across the two tables do not account for much time. In particular, Phone, Talk, Technology, and Other taken together account for only about 5 % of the total time logged. The remaining categories (Discussion, Email, Lecture, Grading, Materials, and Preparation) account for 95% of the activity.

Based on the data presented in Table 2, we make the following observations. First, the subtotals indicate that in the online class, the instructor spends more time on activities that involve interaction with students than the instructor does in a traditional section. This increased interactivity for online sections fits the intention that online classes in this study will emphasize transfer of ideas among participants. The observed enhanced communication also provides further support for prior survey work that indicates that faculty and students both feel that they interact more in online classes than they would in a traditional class (Turroff, Hiltz & Turroff, 2002;

Young, 2002; Salmon, 2002; Hartman, Dziuban & Moskal, 2000; Schifter, 2000a; Schifter, 2000b).

Table 1: Hours per Student per Section - Student Interaction Activities

	Online	Traditional
Discussion	2.34	0.00
Email	0.40	0.51
Lecture	0.00	1.59
Phone	0.06	0.04
Talk	0.00	0.27
Subtotal	2.79	2.42

Table 2: Hours per Student per Section - Other Activities

	Online	Traditional
Administration	0.03	0.06
Grading	1.77	1.82
Materials	1.17	0.78
Preparation	0.37	1.02
Technology	0.12	0.00
Other	0.03	0.02
Subtotal	3.48	3.75

An examination of the columns of Table 1 shows the expected substitution of Discussion activity in online sections for Lecture and Talk activities in the traditional sections. Perhaps more interesting are the results for the two categories of Email and Phone.

For the Email category, it is noteworthy that both delivery modes show about the same time expended per student, with the traditional mode of delivery even being a bit higher than the online mode. This apparent equivalency in time spent on email for both modes of delivery provides an interesting example of the ways in which the online and traditional delivery formats are likely to increasingly merge over time. The time logged for the Phone category is also approximately equivalent for both modes, and is not very large. It is interesting to note that Phone time is smaller than Email, perhaps reflecting the value of asynchronous communication in a graduate class environment.

Inspecting the non-interactive categories shown in Table 2, the classes of Administration, Technology, and Other represent only small amounts of time. The Technology time is important since it shows that technical problems were not a significant factor for the instructors in these online classes.

As shown in Table 2, instructor time spent grading is roughly comparable for both delivery modes. This uniformity of effort across the two modes is actually somewhat surprising since instructors often talk about the increased number of steps required to deal with assignments that are submitted and returned online rather than on paper in a traditional setting.

Finally, Table 2 shows some variation by mode in time spent on Materials and Preparation. The higher time figure for the Materials category for the online sections probably reflects the fact that the online versions of the courses in this study are much newer than the traditional versions.

The Materials time difference may also reflect a slower process for creating work items like handouts online due to the relative immaturity of the productivity tools in online environments. We would naturally expect the Preparation time online to be lower since there are no formal class meetings.

Overall, the investigation into the specific types of effort expended by instructors of online and traditional courses revealed a higher degree of interactivity in online courses, and the data results demonstrated an expected trade-off between a higher Materials time figure for traditional courses and a higher Preparation time figure for online sections. One somewhat surprising observation about the type of effort expended by instructors of online and traditional courses is that instructors appear to spend a nearly equivalent amount of time in email and grading activities for both online and traditional courses.

3.1 Efficiency Differences by Mode

In order to get a clearer picture of faculty behavior in both online and traditional courses, we grouped the seven section pairs based on efficiency of mode of delivery. (Note that we use the term *efficiency* here to mean time usage.) In other words, we grouped together the four section pairs in which faculty expended less time on the online sections

(online-efficient) and we grouped together the three section pairs in which faculty expended less time on the traditional sections (traditional-efficient). We then normalized the data on a per student basis to investigate the differences in time expended by the two sets of instructors to try to answer the question “what are the differences in tasks between more and less time-efficient instructors using a particular mode of delivery?”

Upon analyzing the total time expended by instructors when teaching traditional sections, we observed that there was little difference between the amount of time expended by instructors in the online-efficient group, with an average of 6.12 hours spent per student per section, and the effort used by instructors in the traditional-efficient group who expended an average of 6.23 hours per student per section. These results indicate very little variation in instructor time expenditure across the range of sections taught using a traditional mode of delivery, regardless of instructor efficiency with respect to mode of delivery. One logical conclusion that could be made about these consistent results is that instructors are more familiar with the traditional mode of delivery and have already achieved similar levels of efficiency in teaching face-to-face course sections.

A more substantial difference in time expended on online courses was observed when the data from the online-efficient and traditional-efficient groups of instructors were compared for online and traditional sections. Table 3 shows the time expended on both online and traditional courses by the online-efficient and traditional-efficient groups. The online-efficient instructors took 4.66 hours per student to teach the online sections, while the traditional-efficient instructors took 8.4 hours per student to teach the online sections. As previously noted, all sections had negligible activity in the Administration and Other categories so these categories were omitted from Table 3.

One major difference between the two groups that can be observed from Table 3 is the disparity in

Table 3 - Hours per Student per Section for Online and Traditional Sections

	Discuss	Email	Grading	Lecture	Materials	Phone	Prep	Talk	Tech	Grand Total
Online Courses										
Online-Efficient	1.70	0.44	1.10	0.00	1.02	0.06	0.25	0.00	0.05	4.66
Traditional-Efficient	3.19	0.33	2.66	0.00	1.36	0.06	0.51	0.00	0.21	8.40
Traditional Courses										
Online-Efficient	0.00	0.59	1.69	1.55	0.82	0.08	0.90	0.39	0.00	6.12
Traditional-Efficient	0.00	0.42	1.99	1.65	0.72	0.00	1.29	0.10	0.00	6.23

the Discussion figures for the online sections. The instructors in the online-efficient group spent less time than their traditional-efficient counterparts. While the online-efficient group did spend 1/3 more time on email than the traditional-efficient group, this difference is not large enough to account for the 53% increase in Discussion time spent by the traditional-efficient group.

Another major dissimilarity in effort can be observed in the Grading category for the online sections where instructors in the traditional-efficient group spent more than twice the time grading as did the online-efficient instructors. Several reasons may give rise to this difference. First, the traditional-efficient instructors may be taking extra steps when grading online (e.g., detaching email attachments, printing assignments, returning hard copy to students, etc.) as opposed to simply grading directly online. Second, the difference could be the result of instructors struggling to learn how to grade online. The efficiency effect might also be a result of the fact that some instructors are learning how to grade online more efficiently than grading using a traditional approach.

Table 3 also shows increases in instructor time for the Materials category in the traditional-efficient group when teaching online sections. In addition, the traditional-efficient group also shows significant increases in the Preparation category when teaching both online and traditional sections. Possible reasons for these differences include that the instructors in the traditional-efficient group may be less experienced in teaching online or struggling more with the online environment. Another possibility is that the instructors in the traditional-efficient group may be struggling with how to represent the course online.

The difference in the Technology category for online courses is a small number but represents a substantial difference in percentage of effort. As shown in Table 3, the traditional-efficient group of instructors spent four times the amount of effort when teaching online as the online-efficient group. This small difference may be an indicator that the instructors who are less efficient teaching using the online mode of delivery are also less technically capable overall.

One interesting difference occurred in the Talk category for traditional courses where the online-efficient instructors appear to spend almost four times the amount of time talking with students on a per student basis than the traditional-efficient instructors. In addition, the online-efficient instructors also logged more time in the Phone category than their traditional-efficient counterparts when teaching using a traditional mode of delivery.

Overall, when comparing online sections where instructors were more efficient to online sections where instructors were less efficient, there is a wider variance in the time expended than when comparing the efficiency of the groups of instructors when teaching traditional course sections. Indeed, the traditional-efficient group of instructors spent almost double the amount of time on various tasks associated with teaching online as compared to their online-efficient counterparts. Possible reasons for this difference range from changes in course representation, grading, and interaction approaches used in online courses to the technical abilities of the instructor. An examination of instructor evaluations and learning outcomes might provide additional reasons for this difference.

The total time figures for the online-efficient and traditional-efficient groups of instructors teaching using a traditional mode of delivery are much closer than when using an online mode of delivery. However, it should be noted that the online-efficient group still uses slightly less time per student when teaching a traditional course.

4 CONCLUSION AND FUTURE WORK

The results of this quantitative investigation into the differences in instructor time spent on teaching tasks have highlighted several significant differences between time expenditures by instructors of online and traditional courses. Overall, the results reinforce the perception that online instructors engage in more interactive endeavors with their students than do instructors of traditional courses. Also of interest was the finding that instructors spend approximately the same amount of effort on email, regardless of mode of course delivery. The amount of time spent by instructors grading was roughly comparable for both the online and traditional delivery modes.

A finer grained examination of the data scrutinized instructor behavior patterns by grouping instructors into groups based on the mode of instruction in which they were efficient (i.e., spent less time). When efficiency mode of the instructor was factored in, the widest variation of effort was seen in online sections with instructors efficient in online teaching spending significantly less time on grading, materials, preparation, and discussion activities than instructors who were more efficient using the traditional mode of teaching. As could be expected, the online-efficient and the traditional-efficient groups of instructors spent approximately the same amount of time teaching a traditional course.

The results of this study suggest several areas for future research. The obvious future step would be to expand the study to include additional pairs of course sections. This additional data would provide a broader base of support for conclusions drawn by this research. In addition, the inclusion of data from instructor evaluations and learning outcomes would help identify root causes of the differences in time expenditure between online and traditional instructors. A third area of investigation is the impact of instructor attitude on pattern of effort as an instructor's mindset may have a significant influence on how they deliver a course. Lastly, given that teaching an online course requires a certain level of technical knowledge, an investigation of the effect of instructor technical expertise on pattern of effort might also provide insight into the differences in time expended by instructors of online and traditional courses.

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