Evaluation of a web-based course offering

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Abstract
Third year optometry students at the Pacific University College of Optometry were asked to evaluate a required course that was converted from traditional lecture style to a Web-based offering using Net Forms and WebCT software. The course is an introduction to the thesis project to be completed prior to graduation. Eighty percent of responding students preferred to have the course offered as Web-based in the future while sixteen percent advocated use of the Web format with some lecture time. Reasons for preferring the Web format included convenience and ability to work any time and any place (37%), ability to work at own pace (29%), not having to attend lecture (19%), and a new mode of learning (15%). Student evaluation of four aspects of learning revealed a majority favoring the Web as compared to traditional lecture. Based on student acceptance of this course, the growing need to make optometric education more efficient, and the desire to make adult educational techniques available to optometry students, we conclude that additional carefully selected courses should be offered on the Web.

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Robert Yolton

Keywords
optometric education, web-based course, net forms, webct, html, learning techniques

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EVALUATION OF A WEB-BASED COURSE OFFERING

By

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A thesis submitted to the faculty of the
College of Optometry
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Advisor: Robert Yolton, Ph.D., O.D.
SIGNATURE PAGE

Daran deCalesta, B.S.

Robert Yolton, Ph.D, O.D., Advisor
Daran deCalesta, B.S.
Initially attending Penn State University for undergraduate work, Mr. deCalesta received his B.S. with honors from Montana State University in 1993. The following year was spent working toward a Ph.D. in Cellular and Molecular Biology first at Oregon State University and then at Oregon Health Sciences University. The lure of working with patients in a clinical setting pulled Mr. deCalesta away from the lab and he began Optometry school at Pacific University in 1994. After a planned graduation in May of 2000, Mr. deCalesta will likely pursue a residency after joining his wife and fellow optometrist, Dr. Pam deCalesta, in the Eugene area. Long-term professional goals include practice either in partnership with other optometrists or in a co-management center in Eugene.
ABSTRACT

Third year optometry students at the Pacific University College of Optometry were asked to evaluate a required course that was converted from traditional lecture style to a Web-based offering using Net Forms and WebCT software. The course is an introduction to the thesis project to be completed prior to graduation. Eighty percent of responding students preferred to have the course offered as Web-based in the future while sixteen percent advocated use of the Web format with some lecture time. Reasons for preferring the Web format included convenience and ability to work any time and any place (37%), ability to work at own pace (29%), not having to attend lecture (19%), and a new mode of learning (15%). Student evaluation of four aspects of learning revealed a majority favoring the Web as compared to traditional lecture. Based on student acceptance of this course, the growing need to make optometric education more efficient, and the desire to make adult educational techniques available to optometry students, we conclude that additional carefully selected courses should be offered on the Web.

KEY WORDS: Optometric education, Web-based course, Net Forms, WebCT, HTML, learning techniques.
INTRODUCTION
Theories of education suggest that teaching of children has two functions: instilling socialization skills and imparting knowledge. Self-directed adult learning focuses on imparting knowledge. Computers can be used very effectively in adult learning programs to deliver "any time, any place" knowledge. To demonstrate this concept, a one-credit course in the third year curriculum at the Pacific University College of Optometry was converted from a traditional lecture style to a Web-based offering.

The converted course, entitled "Introduction to Thesis," gives background information on the thesis project required of all students prior to graduation. Past thesis projects have covered a range of topics including clinical trials, literature reviews, surveys, and practice-oriented Web sites. Prior to 1997-1998, this course was presented as a weekly one-and-a-half hour lecture with an associated handbook as a reference text. The text consisted of seven chapters on topics ranging from statistics to publication. In the summer of 1998 the course material was converted into Hyper Text Markup Language (HTML) and published to a Web site on the College of Optometry's Web server.

Students worked through seven modules mirroring the seven chapters from the previously used text. The module subjects were as follows:

1. Introduction and Planning
2. Preparing a Project Description and Beta Sigma Kappa Grant Application
3. Acquiring Information Electronically from the Library and Other Resources
4. Use of Human Subjects and Clinic Facilities
After reading each module, students tested their comprehension of the material by taking an online quiz. Each quiz consisted of ten multiple choice questions that students would answer and then submit electronically. Feedback was given so that a student would know if any questions were missed on a quiz. Each of the quizzes had to be passed with a perfect score as one of the required elements of the course. Results of the quizzes, including the time, date, and total number of attempts, were emailed to the course instructor for record keeping. In addition to the quizzes, students were required to file an application for a Beta Sigma Kappa research grant and submit a summary page detailing the proposed thesis project. Weekly office hours were maintained by the instructor throughout the course, and there were no lectures given excepting two initial orientation presentations at the beginning of the course.

As students completed the modules, they were asked to evaluate their experience by way of a Web-based survey. This survey consisted of a combination of multiple choice questions and fill in the blank opportunities. A printed replica of the survey was distributed one month after course completion to improve participation. Students were asked to submit only one survey. Data from the surveys were tabulated and used to compare student perceptions of traditional lecture versus Web based information delivery.
The goals of this project were to learn the efficiency of developing and delivering Web based educational content previously disseminated through lecture, and to assess student utilization and opinion of this learning mode. It was hypothesized that using Web based delivery of information would be an effective means of educating adult learners such as third year optometry students.

**METHODS**

*Web Page Creation*

Text from the original course handbook was imported into Microsoft Word 8.0 for Windows and saved directly into Hyper Text Markup Language, or HTML. Using Adobe Pagemill 2.0, a table of contents and introduction page were created to preface the seven modules of course content. Two methods of accessing the modules were devised. The first method, known as "Straight-Text," displayed all of the text of one module on a single, scrolling Web page without any graphics. The second method was known as the "Enhanced" version that divided each module up into six or more separate consecutive Web pages. The enhanced version utilized graphical images to reinforce the text and/or entertain the reader.

Quizzes for each module were created by the course instructor and then converted into HTML with Word. Net Forms 1.0 software was used to create a system for recording the results of the quizzes for each student. As a part of this system, the course instructor received an email message indicating when all seven of the quizzes had been passed for a given student. After completion of the course, the original pages of content, graphics, and quizzes were transformed with WebCT 1.0 software. This software offered more organization, student evaluation tools, and better control over quiz parameters such as time allowed for quizzes. Subsequent administrations of the course are planned to be offered using the WebCT-designed modules.
Survey Creation

The survey was created in Word 8.0 and saved as HTML. Adobe Pagemill 2.0 was again used to transform the data into an online form that automatically sent responses via email to the project authors. A printed version of the survey, with the same questions and formatting, was distributed to all students in the class one month after the class was over in order to improve participation. Those students who had filled out Web-based surveys were asked to refrain from taking the survey a second time. Sixty percent (fifty of eighty-four students) of the class completed surveys.

RESULTS

Results from the survey are organized into sections used in the survey: Background Information, Obtaining Information from the Modules, and Overall Perspectives.

Background Information

Information about prior experience with the World Wide Web and about initial expectations of a Web-based course was gathered as a baseline and to guide the expansion of Web-based learning at Pacific. The majority of students (66%) described their Web experience as "Some," 24% chose "Frequent" or greater than four hours per week, and the remainder indicated they had no previous Web experience. When asked what the perceived benefit of this type of course was prior to taking it, the greatest number of students (37%) selected "Convenience," while other students preferred working at their own pace or a lack of lecture. See Table 1 for the range of student choices.

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Insert Table 1 here
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8
Obtaining Information from the Modules

This section formed the majority of the evaluation and offered insights into the strategies that students used to learn from this format. Questions investigated the amount of time spent on modules, preference for printing modules or reading on the screen, and use of enhanced or straight text modules. Students were also asked to rate the ease of understanding for each module, to list when during the semester work on modules began, and to compare the Web modules to "traditional" lecture in four areas of learning.

Students spent an average of an hour or less on each module. Module six, requiring statistical manipulation of data, was the only deviation to this pattern with a 2 hour average time. Module six was also the only module that was printed more often than read on the screen. Table 2 shows the pattern of student preference for viewing the information on the screen rather than printing it out.

Of the two module formats, the enhanced version was more popular (56%) than the straight text presentation (44%), but the margin was closer than anticipated. A fairly uniform preference for enhanced style was observed for each of the modules; this pattern can be seen in Table 3.

Students rated their preference for ease of understanding of information by choosing between lecture delivery, Web based module delivery, or equal preference between lecture and Web
based styles. For most modules, equal was the most frequent choice with the exception of Module 6 which was heavily weighted toward the lecture choice. Table 4 lists the percentages for individual modules.

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Insert Table 4 here  
---

Students appeared to be motivated to start work on the modules early with 72% listing the beginning of the term as when they started; the remainder of students started at the middle of the term. No students responded with near the end or very near the end.

One of the most valuable sections of data came from the comparison of Web modules with traditional lecture in five aspects of learning as listed in table 5. The responses to this section were mixed, with two strong preferences for Web-based instruction (learning was more enjoyable and learning was more efficient), one preference for lecture (more motivation), and two equal preferences (understanding easiest and learn more). Eighty percent of responding students favored the Web format when asked which mode should be used in the future for this course.

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Insert Table 5 here  
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Overall Perspectives
The final section of the evaluation assessed the location where most of the work was completed, examined problems with VDT screen use, and gave students a chance to provide their overall thoughts about the course.
Although the majority (59%) worked on the modules from school, some students worked from home and places of work. Most students did not have problems with viewing the information on the computer screen with 52% marking "Fine - it did not bother me" and 22% choosing "Neutral - I didn't notice." Twenty percent chose "Unhappy, had problems" but did not elaborate on their problems. The remaining six percent chose "unacceptable" and responded with fill-in comments such as problems with "accommodative spasms," "dry eye symptoms," and "print is too small."

**DISCUSSION**

Student response to the Web based course was very favorable relative to traditional lecture. The convenience of learning at a pace and place set by the student was an important finding from the surveys. Responses to direct comparison of Web and lecture were weighted toward the Web except in the area of motivation for learning. It could be that despite being efficient and entertaining, the Web format "seems more like fun than work" as one participant stated, but this attitude may change as students are exposed to this form of learning earlier in their educational careers. Certainly, students in this course did not report that their ability to understand the material was compromised by the Web format. The majority of students rated their understanding of course material as equal between Web and lecture in response to two different questions.

There were indications that supplementing a Web based course with occasional lecture would be beneficial, especially when dealing with new concepts that required more interaction between student and instructor. Module six, involving an introduction to and use of a statistics software program, caused many students to report that a lecture format or combination of Web and lecture would have been easier. Depending on the course content, heightened interactivity requirements
may necessitate some lecture time. Advances in technology and software areas such as streaming video and Web conferencing will likely allow for interactivity between students and instructors within the structure of the Web based course.

While assessing the practicality of offering additional courses on the Web, the reality of implementation must be considered. To begin with, it can often be assumed that the content of a course is already available and that there is access to the various software programs necessary to modify the course content into the Web-based offering. Next, a working knowledge of the software must be gained: to learn WebCT required attending a two day seminar and approximately 35 hours of "hands-on" learning while working on this project. Each Web based module, including graphics and quizzes, averaged five hours to complete (every module replaced a lecture that required three hours to prepare and 1.5 hours to deliver). According to instructor estimates, maintenance of either a single lecture or Web-based module required nearly two hours per administration. Thus, the total time investment for either educational style is nearly equal. The scales tip in favor of the Web when considering greater potential audiences per time invested, as well as improved technology that will diminish design time in the future.

CONCLUSIONS

Our experience with this course leads us to believe that Web-based course offerings in an optometric curriculum can be effective supplements to, and even replacements of, appropriate courses. Adult learners can work with material delivered on an "anytime, anyplace" basis which fits the mode of the Web course. Compared to a lecture format, students in our test course reported that the Web-based format was more enjoyable, convenient, and efficient. Additional
courses will help to determine if these preferences are transferable to other subjects offered on the Web.

The investment of time for the instructor appears to be similar for lecture and Web styles after the initial mastery of requisite software. The time for Web construction can be expected to decrease with familiarity and as technology improves. It is conceivable that as Web courses expand in education, the role of educators may expand to include design of Web sites in addition to delivery of information. It is clear that Web-based learning has certain advantages over traditional lecture, and it is with the introduction of additional courses that we will fine-tune these advantages to offer more efficient, time- and space-independent, education.
ACKNOWLEDGEMENTS

The author wishes to thank the outstanding efforts of the computer support staff at Pacific University for their assistance in mentoring and troubleshooting in the areas of HTML and server issues. Additional thanks to the members of the Pacific University College of Optometry Class of 2000 who worked hard and adjusted quickly to this project with very little notice.
APPENDIX A: Text Version of the Student Survey

EVALUATION OF WEB-BASED COURSE:
OPT 791 - THESIS PLANNING

This is an evaluation for the class from this summer - we had about 35 people fill them out over the Web, but we need to get as close to 100% response as is possible. If you haven't already filled one of these out, it takes about 5-10 minutes; if you are thinking you won't do it at all, please at least go through and check the check box questions - that takes about 3 minutes. If you have already filled out the form over the summer, thank you! This project is turning into a thesis project and I would appreciate all the help I can get. When you are done please turn this form in to my mailbox.

Thank you! Daran deCalesta

Section I - Background Information

1. Please describe your use of the Web and Web based computer software prior to this class. Make your choice by placing a check in the box next to the appropriate answer.
   - Frequent (more than 4 hours/wk)
   - Some (less than 4 hours/wk)
   - None

2. When you first learned that this course would be offered in a Web-based format, what did you perceive as the greatest benefit of this format?
   - Lack of Lecture
   - Convenience (you could work from home)
   - Pace (ie, you could work at your own pace)
   - New Mode (a new form of learning)

Section II - Obtaining Information from the Modules

3. Exclusive of time taking the quizzes, about how much time did you spend reading/studying the material in each module and working through any required exercises? Please round your answer to the nearest 0.5 (one-half) hour if possible. Also please mark the space to indicate if you printed or read each module from the screen.

<table>
<thead>
<tr>
<th>Module</th>
<th>Time Spent to nearest 1/2 Hour</th>
<th>Check for Printed/Screen Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>One - Introduction</td>
<td></td>
<td>□ Printed □ Screen</td>
</tr>
<tr>
<td>Two - Funding and Applications</td>
<td></td>
<td>□ Printed □ Screen</td>
</tr>
<tr>
<td>Three - Information Acquisition</td>
<td></td>
<td>□ Printed □ Screen</td>
</tr>
<tr>
<td>Four - Subjects and Facilities</td>
<td></td>
<td>□ Printed □ Screen</td>
</tr>
<tr>
<td>Five - Research Design</td>
<td></td>
<td>□ Printed □ Screen</td>
</tr>
<tr>
<td>Six - Data Analysis and Statistics</td>
<td></td>
<td>□ Printed □ Screen</td>
</tr>
<tr>
<td>Seven - Publication and Formats</td>
<td></td>
<td>□ Printed □ Screen</td>
</tr>
</tbody>
</table>

4. If you printed out any of the modules, please explain why.
5. With respect to the style of the modules, which version did you use: the Enhanced (with graphics) or the Straight Text? Also as compared to material delivered in a lecture format, please rate the degree to which you found the material in the module easy to understand. Use a 3 point scale with: 1 = material delivered in lectures is easier to understand, 2 = modules and lectures were equally easy to understand, and 3 = material delivered in modules is easier to understand.

<table>
<thead>
<tr>
<th>Module</th>
<th>Enhanced/ Straight Mode</th>
<th>Rating of Ease of Understanding</th>
</tr>
</thead>
<tbody>
<tr>
<td>One - Introduction</td>
<td>Enhanced</td>
<td>1</td>
</tr>
<tr>
<td>Two - Funding and Applications</td>
<td>Enhanced</td>
<td>1</td>
</tr>
<tr>
<td>Three - Information Acquisition</td>
<td>Enhanced</td>
<td>1</td>
</tr>
<tr>
<td>Four - Subjects and Facilities</td>
<td>Enhanced</td>
<td>1</td>
</tr>
<tr>
<td>Five - Research Design</td>
<td>Enhanced</td>
<td>1</td>
</tr>
<tr>
<td>Six - Data Analysis and Statistics</td>
<td>Enhanced</td>
<td>1</td>
</tr>
<tr>
<td>Seven - Publication and Formats</td>
<td>Enhanced</td>
<td>1</td>
</tr>
</tbody>
</table>

6. When during the term did you begin your work on the modules?
   - [ ] Near the beginning
   - [ ] Near the middle
   - [ ] Near the end
   - [ ] Really near the end (ie, you crammed)

Please compare the traditional lecture and handout style of presentation to the Web module style of presentation SPECIFICALLY FOR THIS CLASS using the following variables. Please check the best answer.

7. I think I would learn more with:
   - [ ] Web Module Style
   - [ ] Lecture Handout Style
   - [ ] Equal
   - [ ] Other (please list below)

   If you marked "Other" please explain:

8. My learning would be more efficient with:
   - [ ] Web Module Style
   - [ ] Lecture Handout Style
   - [ ] Equal
   - [ ] Other (please list below)

   If you marked "Other" please explain:

9. My learning would be more enjoyable with:
   - [ ] Web Module Style
   - [ ] Lecture Handout Style
   - [ ] Equal
   - [ ] Other (please list below)

   If you marked "Other" please explain:

10. My motivation for learning would be higher with:
    - [ ] Web Module Style
    - [ ] Lecture Handout Style
    - [ ] Equal
    - [ ] Other (please list below)

   If you marked "Other" please explain:
11. If other courses were modified to be offered in a Web format, which courses would be most appropriate?

Section III - Quizzes

12. When you missed an answer on a quiz, which of the following did you do most commonly?
   - [ ] Just retook the quiz until I got the answer right
   - [ ] Looked back into the module for the answer
   - [ ] Did both about equally
   - [ ] Other (please list below)
   If you marked "Other" please explain:

13. If you were not told which answers you got wrong and had to retake the whole quiz, would you return to the module for answers or just keep taking the quiz?
   - [ ] Return to the Module
   - [ ] Keep retaking the quiz
   - [ ] Other (please explain below)
   If you marked "Other" please explain:

14. Should there be a penalty for having to retake the quiz repeatedly?
   - [ ] Yes
   - [ ] No
   - [ ] Other (please explain below)
   If you marked "Other" please explain:

15. What did you think about receiving the results of your quiz that reinforced the correct answers you submitted?
   - [ ] I liked it - keep it as a feature
   - [ ] I did not like it - remove it as a feature
   - [ ] I am neutral on this one
   If you marked "Other" please explain:

Section IV - Overall Perspectives

16. Should we return to the traditional lecture/handout teaching style for this course next year or keep the Web format?
   - [ ] Return to the lecture/handout format
   - [ ] Continue the Web format
   - [ ] Other (please explain below)
   If you marked "Other" please explain:

17. Where did you do most of the work on the modules?
   - [ ] Home
   - [ ] School
   - [ ] Other (please explain below)
   If you marked "Other" please explain:

18. What parts of the Web module approach to education were good and should be retained?

19. What parts of the Web module approach to education were not good and should be changed?
20. How did you feel about looking at the VDT screen for this course?

☐ Fine - it did not bother me  ☐ Unhappy - I experienced problems (please list below)
☐ Neutral - I didn't really notice  ☐ Unacceptable - I had to print the forms out to complete this class

Use this space for associated comments/problems/visual complaints from viewing the VDT screen:

21. Please use the following space for any additional comments or suggestions.
<table>
<thead>
<tr>
<th>Percentage of Students</th>
<th>Convenience</th>
<th>Working at own Pace</th>
<th>Lack of Lecture</th>
<th>New Mode of Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>37%</td>
<td>29%</td>
<td>19%</td>
<td>8%</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Percentages of perceived benefits at the beginning of the course
<table>
<thead>
<tr>
<th>Module</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
<th>Four</th>
<th>Five</th>
<th>Six</th>
<th>Seven</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printed</td>
<td>18.7%</td>
<td>39.6%</td>
<td>38.7%</td>
<td>37.5%</td>
<td>44%</td>
<td>60.4%</td>
<td>49%</td>
</tr>
<tr>
<td>Viewed on Screen</td>
<td>81.3%</td>
<td>60.4%</td>
<td>61.3%</td>
<td>62.5%</td>
<td>56%</td>
<td>39.6%</td>
<td>51%</td>
</tr>
</tbody>
</table>

Table 2: Percentages of students printing modules versus viewing modules on screen
<table>
<thead>
<tr>
<th>Module</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
<th>Four</th>
<th>Five</th>
<th>Six</th>
<th>Seven</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhanced</td>
<td>61%</td>
<td>55%</td>
<td>55%</td>
<td>55%</td>
<td>57%</td>
<td>55%</td>
<td>55%</td>
</tr>
<tr>
<td>Straight Text</td>
<td>39%</td>
<td>45%</td>
<td>45%</td>
<td>45%</td>
<td>43%</td>
<td>45%</td>
<td>45%</td>
</tr>
</tbody>
</table>

Table 3: Percentages of module style used
<table>
<thead>
<tr>
<th>Module</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
<th>Four</th>
<th>Five</th>
<th>Six</th>
<th>Seven</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equally Easy</td>
<td>44%</td>
<td>48%</td>
<td>42%</td>
<td>46%</td>
<td>50%</td>
<td>16%</td>
<td>42%</td>
</tr>
<tr>
<td>Module Easier</td>
<td>42%</td>
<td>36%</td>
<td>38%</td>
<td>40%</td>
<td>28%</td>
<td>12%</td>
<td>50%</td>
</tr>
<tr>
<td>Lecture Easier</td>
<td>14%</td>
<td>16%</td>
<td>20%</td>
<td>14%</td>
<td>22%</td>
<td>72%</td>
<td>8%</td>
</tr>
</tbody>
</table>

Table 4: Percentages of ease of understanding information by information delivery system
<table>
<thead>
<tr>
<th>Question</th>
<th>Web</th>
<th>Lecture</th>
<th>Equal</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn more with which format?</td>
<td>22%</td>
<td>22%</td>
<td>36%</td>
<td>20%</td>
</tr>
<tr>
<td>Learning more efficient with which format?</td>
<td>44%</td>
<td>16%</td>
<td>28%</td>
<td>12%</td>
</tr>
<tr>
<td>Learning more enjoyable with which format?</td>
<td>54%</td>
<td>12%</td>
<td>28%</td>
<td>6%</td>
</tr>
<tr>
<td>More motivation for learning with which format?</td>
<td>30%</td>
<td>40%</td>
<td>26%</td>
<td>4%</td>
</tr>
<tr>
<td>Understanding easiest with which format?</td>
<td>34%</td>
<td>19%</td>
<td>47%</td>
<td>-</td>
</tr>
<tr>
<td>Which mode should be used in the future?</td>
<td>80%</td>
<td>4%</td>
<td>-</td>
<td>16%</td>
</tr>
</tbody>
</table>

Table 5: Percentages of preference for learning styles in four aspects of learning