

**TRANSFERRING YOUR PASSION FOR TEACHING TO THE ONLINE ENVIRONMENT:
A FIVE STEP INSTRUCTIONAL DEVELOPMENT MODEL**

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Abstract

An instructor's quest to express her personality and passion for teaching in an online course, without compromising academic rigor, led to the creation of a five-step instructional development model. This article describes the process from inception to assessment in the context of an online Histology course and provides a guide for others considering developing online science courses. The instructor's perceptions are validated by data from student evaluations.

Introduction

Can an instructor's passion for teaching be transferred to the online environment? There is real joy and excitement in sharing the details of science; and deep satisfaction is gained from interaction with students. When science teaching moves into the realm of the Internet, many instructors fear losing these two primary motivators. This article describes how an online course was developed to retain these motivators and preserve the academic rigor of the course. The "Five O's" of the development of an online course: origin, organization, orchestration, obstacles, and outcomes assessment of an online Histology course are described as seen through the eyes of a faculty developer. This paper provides a practical guide to developing an online science course for the passionate (and compassionate) instructor at any educational level.

Background

Fear, ignorance, time constraints, bureaucratic red tape, faculty-student interactions, academic rigor - all are concerns of a teacher embarking on the development of an online science course. One has to wonder how instructors are able to undertake such an ordeal given the potential obstacles. The author embarked on such an adventure four years ago with a commitment to develop a stand-alone Histology course. The goal was to develop an academically rigorous course that replicated an on-campus lecture and laboratory experience, while fostering instructor-student interactions. Persichitte (2000) states that the main roles online environments must fulfill are to provide opportunities for students to interact with each other and the instructor, support active engagement with the content material, allow for individualized instruction, and employ appropriate instructional media. This article describes how these criteria have been met in a Histology course.

Histology, the study of tissues, is a course taught by the first author in an on-campus environment for fifteen years and online for three years. The process of developing an online course, from inception to assessment, is outlined below.

The Five O's

The process of developing an online course can be described in five major categories: 1) Origin: a) analyze your audience, b) evaluate the suitability of your course content for online delivery, 2) Organization: a) choose a delivery system, b) get over your fears and get organized, 3) Orchestration: a) develop your materials, b) test your materials, c) keep editing and modifying, d) keep pace with emerging technologies, 4) Obstacles: obtain curriculum committee approval, and 5) Outcomes assessment: assess and evaluate your course. The basis for initiating this process was an acknowledgement of the increasing need for students to have access to upper division science courses in non-traditional formats (Green, 1999).

Origins

This section describes how the online course was first conceived. Considerations were given to the audience and appropriateness of the material for online presentation.

Analyze your Audience. Get a good idea of who your learners will be and identify their needs. A report from the American Association for Higher Education (Mellow 1999) describes the demographic characteristics of today's college students and supports the need for access to nontraditional instruction. Histology is a course required to complete several science degrees on the Colorado State University campus. In addition, the campus supports a large population of pre-health students desiring the course for preparation for admission to professional or graduate programs. Numerous advising interactions with these students revealed significant need for science courses offered outside of the regular on-campus environment and schedule. Jobs, family responsibilities, and financial constraints all contributed to an increasing population of students desiring alternate access to science courses.

The need for this step was validated by student comments at the end of the course. Students clearly appreciated the opportunity to complete an upper-level science course online, as illustrated by the following comments:

"I like the flexibility a class like this offers. It makes it possible for students in the working world to still be able to get classes and not have scheduling conflicts."

"The format is a lot more flexible than regular classes and that's great for people who work, have families, live in remote areas, etc."

Are there any existing courses that can be modified to meet your learners' needs? When the decision was made to develop the online Histology course, there were no similar courses offered online. One of the off-campus students enrolled in the course touched upon this issue when s/he commented: "It was great to be able to take a class that my school does not offer in the summer and to get credit at my home university."

Evaluate the suitability of your course content for online delivery. The next step is to examine your course content. Which parts can be delivered online? Are there elements that need to be taught in a face-to-face setting? Which elements of your presentations are really essential to your objectives? Shale (1988) states that the process of education is the same for students and teachers regardless of face-to-face or separation. Clearly, however, certain content, such as psychomotor skills, cannot reasonably be taught at a distance.

Conflicted is the best term to describe the instructor's feelings about offering Histology without classroom contact; however, Histology is an image-intensive field of study, making it ideally suited to the computer environment. The biggest hurdle to overcome was accepting that a course in Histology did not need to result in the development of psychomotor skills associated with manipulation of a microscope (a field known as microscopy). The goal of the online course was to have students develop higher-order thinking skills and understand the concepts of Histology. Once this decision was made, it became relatively easy to accept the online environment as suitable for teaching the subject.

Assumptions about the suitability of the material were echoed in student comments:

"For the subject material, I think the online course is a better option than a live lecture."

"The labs online were extremely helpful and fast. You didn't have to waste time with a microscope and slides, they [the images] were there for you."

"Often times in classes that use microscopes, I never know if what I'm looking at is really what I think it is."

"This course made everything very clear."

"I am a visual learner and the quality of histological pictures definitely enhanced my online experience."

Organization

It is important to convert the overall goal of developing an online course into a series of enabling objectives in

order to keep from being overwhelmed by the magnitude of the task.

Choose a delivery system. Examine and compare available delivery options. Make a list of characteristics that are important to you, such as controlling student access and ease of access. Decide what features you need and will use, such as test-generating capabilities, and what features are nice but not necessary (i.e. whiteboard, space for student presentations, etc). Compare the systems based on cost and availability of technical support. A fancy courseware system may not be necessary if you aren't going to test students online, but features such as a grade book may still come in handy.

WebCT, an online course delivery system, was selected as the delivery system for the Histology course. It controls user access to the course and provides an easy and intuitive navigation system. The CD-ROM capability allows images to be downloaded from a CD while the course runs from the Internet. In addition, WebCT permits detailed tracking of students, giving the instructor information about time-on-task - very useful when assisting students with meeting course expectations. Tool functions, such as online chats, became an essential part of the course. The overall result was rapid download times, flexible and interactive access, and control of the course.

The developer's perspective was validated by student comments on an exit survey. When asked how they found technical access to the course, 66% of students responding to the survey chose very easy and 31% chose easy (See Table 1). In the free-response section of the survey, students made comments such as:

"I feel that I retained more of this course by taking it online and working at my own pace than lecture-type courses."

"Online chats were an excellent review, and I felt that I performed better when attending them, plus they helped me to stay on schedule with the material."

Get over your fears and get organized. It doesn't take a programming degree to design an online course if you're willing to take it one step at a time. Start by creating a detailed `to-do' list. Write down every goal you hope to accomplish and break it up into small, `do-able' pieces, such as `scan microscope slides into digital format'. Fear was one of the biggest barriers the first author had to overcome.

She lacked significant computer expertise and had no knowledge of HTML or website development. What kind of learning curve would be involved? When was all of this planning and effort going to fit into an already busy schedule? Initially, the time working on course development was in addition to other projects, but eventually, time was allocated to this effort. Another big fear involved the physical separation of instructor and students. The goal evolved into an attempt to mimic the on-campus lecture style of the instructor. Conscious acknowledgement that this was not to become a textbook-style presentation freed the instructor to creatively insert humor, story asides, and clinical applications that mimicked her in-class lectures. Though fear and distrust of technology loomed throughout the majority of the development process, the major impetus for getting started was to create an organized and structured `to-do' list (design plan). Though this list was greatly modified as progress was made, it was an important guide to getting started. The main items for getting started were small tasks, each leading to a more complicated step in the process.

Orchestration

Now it's time to start putting the pieces together and build a course that reflects the instructor's teaching style, while meeting high standards of academic rigor. Think of a successful online course as an assembly of many smaller components, such as exams, lectures, activities, etc., and focus on each of these components separately.

Develop your materials. When you start to prepare your own materials, keep in mind that you don't have to re-invent the wheel or do everything yourself. There are plenty of textbooks that can be used with your online course, just as they would in a face-to-face setting. Your goal is to create an online class, not an electronic book. Try to re-create one of your lectures, including the stories you would tell and examples you'd give. Don't be afraid to let your personality show! Chat rooms and bulletin boards can be used to simulate a classroom environment - it just requires some advance planning. For example, be sure to prepare a list of content questions before engaging in an online chat, in case students need prompting to stay on task.

Acknowledging that a textbook would be required to support information needed beyond the lecture was critical to accepting online delivery as an appropriate substitute for the on-campus lecture environment. The on-campus Histology course syllabus was followed to develop content. First, lectures were written in a style very similar to on-campus presentations. Images were captured and inserted.

One activity that was challenging to duplicate online was the instructor's use of "bonehead quizzes" at the end of each lecture. In the on-campus class, the instructor put a plastic bone on her head and challenged students to answer three or four basic questions about the content just covered. It gave the students immediate feedback on their learning for that session. This fun and important check on learning was duplicated by inserting a humorous photograph of the instructor at the end of each online lecture. The student clicks on the photo and is asked three or four key questions about the lecture just completed. The answers are available by a click of the mouse. These bonehead quizzes have been very favorably received and have contributed to student perception of the instructor's personality.

The successful implementation of these design decisions is evidenced by the following student comments:

"The clinical notes and personal anecdotes offered a personal touch and sense of humanity that has been missing from the previous online courses I have taken."

"I had physiology with Dr. McConnell [on campus] as well as this course, and the teaching style is very similar."

"The lectures were competent and gave a good understanding of the topics, and were well complemented by the text. If both of these sources didn't offer the answer I wanted, I was always able to send an email and ask questions, which was comforting."

Student-faculty interactions and the development of a sense of community are achieved in the online course through frequent email interactions and weekly online chat sessions. The instructor leads these chat sessions

and students are called upon to pose questions for each other. This helps them to focus and solidify their own understanding of the concepts into meaningful questions. In addition, time at the beginning and end of the session is spent in casual exchanges with the students, creating a sense of community. Recently, online students organized a second online chat session per week, led by members of the class. Though optional, over 60% of the students in the class regularly attend chat sessions.

The students reported great satisfaction with the teaching methods employed and their ability to interact with the instructor.

"I particularly liked the interaction with the professor through online chats. It was a million times easier to get questions answered and really discuss topics this way."

"Dr. McConnell is an incredible teacher - probably the best I've ever had, and I have never even attended a live lecture that she has given! She is personable and puts so much effort into communication with us on online chats and email - I feel I know her personally."

"This class was much more personal in this kind of environment."

These comments were especially rewarding and helped confirm the instructor's observations that significant instructor-student interactions could occur in the online environment. An interesting personal experience further confirmed this observation. Spring 2000, the author concurrently taught the online Histology course and a large undergraduate gross anatomy course including laboratory. In the online Histology course, the instructor became well acquainted with a student named "Lisa" by sharing personal life stories and experiences through computer-mediated communication. On the last day of class in the gross anatomy course, a student whom the instructor vaguely recognized introduced herself as "Lisa" from the online Histology course. It was somewhat of a shock and revelation to realize how close of an instructor-student bond could be forged exclusively with virtual interactions, while face-to-face contact certainly did not assure it!

Development of online Histology laboratories was a challenge. In the on-campus laboratory, students looked at and manipulated glass slides using a microscope. The online laboratory permits students an identical experience except for physically manipulating the microscope. In the interactive online laboratories, students can move back and forth between low, medium, high and oil images with the click of a button instead of a flick of a microscope objective. Arrows, icons and interactive overlays assist students in identifying important structures.

Students seemed to readily accept this delivery medium. They wrote:

"Having pictures and information relating to pictures right next to each other was very helpful."

"The online slides were outstanding - the virtual lab was done quite well!"

Examinations were developed with the WebCT quiz maker. They are identical in content to on-campus examinations and contain multiple-choice questions about lecture material and short-answer questions for

laboratory identification. All examinations are taken on the same date and monitored either by the instructor or an approved on-site proctor. Student comments on this method of testing were generally positive.

Some comments from students included:

"It took a little while to get accustomed to the testing, but I liked the fact that the results were almost instantaneous, and I really enjoyed the statistics part of the exam analysis."

"The exams were really very challenging. I think they were designed well to test the knowledge taken away from the course."

Other developments include an interactive course syllabus and calendar. These enhancements permit students to pace themselves through the lectures and laboratories, especially important since examinations are given synchronously.

Though no funding was available in the initial development stages of the course, the instructor offered independent study credit as a creative means of obtaining student labor. Unfortunately, as students became trained in the use of WebCT, and as WebCT became more popular on campus, these students were hired by other faculty who had more funding. Training became, and continues to be, an ongoing burden.

Test your materials. Have students and colleagues test your materials before going live. This feedback will not only ensure a more professional-looking course, but will also give you valuable encouragement and ideas for improvement. The first year, although the course was only half-complete, students were recruited to take the course for independent study credit and to provide comprehensive feedback and editing. Positive feedback about the basic course presentation encouraged the instructor to move forward with completion of the course.

Keep editing and modifying. Keep improving the course. Continual editing and updating of materials is essential, just as for face-to-face lectures. It is important to eliminate all distracting grammar and spelling errors. Students are great resources for editing; and independent study credit can be given to students who participate in this process.

Keep pace with emerging technologies. Students expect online courses to be delivered using the newest technologies. Some of these, such as Flash software, can be used to enhance your course content and present material in ways that will accommodate a variety of learning styles. Beware, however, of using something just because it's there. Too many bells and whistles are just that - and become a distraction from course content.

Obstacles

Change is a complex process. Persichitte (2000) emphasizes the need for active intervention and modeling in order for faculty to accept and adopt technology in their teaching. People are naturally suspicious about the value of new methodologies, and faculty are no exception. A major obstacle encountered by the author was difficulty in persuading her peers that a new delivery technique (online instruction) would not affect the quality

of the course or pose a threat to traditional teaching.

Curriculum Committee approval. Be prepared to justify your course more thoroughly than any on-campus course. Online education is a relatively new phenomenon, so college curriculum committees are not prepared to deal with issues such as approving and accrediting online courses. Expect questions about academic rigor, number of credits, and course quality. Prior to being approved by departmental, college and university curriculum committees, the Histology course could only be offered for independent study credit. It took ten different applications/presentations, including personal appearances at meetings, to get the course partially accepted.

Committee concerns included how to establish equivalency in credits, lack of instructor-student interactions, examination proctoring, academic rigor, and the issue of the absence of a microscope manipulation laboratory. There was also an over-riding theme of fear of replacement of faculty by this new technology. The first step offered was approval as a year-long Experimental Course unusual, because the completed course had already been offered over a year for independent study credit. After several additional applications and appearances, the course was finally approved as a regular upper division science course for four semester credits. A one-credit optional on-campus microscopy laboratory was also approved.

One year later, the same committee approved discontinuing the on-campus lecture course and replacing it with the online course, indicating a rapid evolution of faculty ideas and conceptions about online teaching. From an instructor's point of view, negative peer perceptions and two years of rejection of the online medium was the most stressful part of the development process.

Outcomes Assessment

All teaching innovations need to be tested in order to validate academic rigor and benefit. This is especially true in educational settings, where there is always the concern of harming students by following a fad that may or may not have any pedagogical value. Ongoing assessment and evaluation are critical to success.

Assess and evaluate your course. In order to provide justification and to demonstrate academic rigor for online instruction, gather objective data such as scores on exams (it helps if you have something to compare them to) and subjective data such as student preference. Some quotes from the end-of-course survey have been used in this article to support outcomes. This information was also used to assess student satisfaction with the course and identify areas for improvement. Spring semester 2000, an instructional designer specializing in science education (second author) offered to assist in evaluation and assessment of the online Histology course. This was also the last semester that both the online and on-campus versions of the course were taught simultaneously and by the same instructor. The study revealed that students in the online section outperformed their peers in the on-campus section on content tests. Also, a greater depth of thought was demonstrated in the questions asked online compared to face-to-face. A full discussion and analysis of data collected about academic performance and classroom interactions can be found in a separate report (Schoenfeld-Tacher, McConnell & Graham, under review).

Student Survey

Table 1 summarizes student responses to an anonymous end-of-course survey designed to assess student satisfaction with the delivery medium.

Clearly, students felt the course was readily accessible, and at least equal in academic rigor to comparable on-campus courses. A comment from one of the students summarizes the entire experience from their perspective.

"Overall, this is one of my favorite classes that I have taken at CSU."

Summary and Conclusions

Online science teaching is challenging and almost overwhelming when contemplating development of an entire online course from inception. The authors' experience serves as an example of how most barriers can be overcome through planning and logical progression. An instructor's passion for teaching can be manifested in the online environment, and great satisfaction can be gained from interaction with students. Given the current trend towards increased online course delivery, most instructors can expect to be faced with the challenge of developing and teaching an online course during their career. In 1999, 46.5% of universities offered one or more full college courses online (Green 1999). The Five O's of development described in this article demystify the process of online course development and help teachers transform their content expertise into effective, appealing and accessible on-line instruction.

References

Green, K. C. (1999). *Campus computing 1999*. Encino, CA: Campus Computing.

Mellow, G. O. (1999). *Characterizing the new American student*. Washington, DC: American Association for Higher Education.

Persichitte, K. A. (2000). *You can run but you can't hide: Technology integration in higher education*. Unpublished paper prepared for the CSU College of Veterinary Medicine and Biomedical Sciences Teaching and Learning Conference (2000), Fort Collins, CO.

Schoenfeld-Tacher, R., McConnell, S., & Graham, M. Do no harm: An examination of the outcomes of a distance delivered science course. *Journal of Science Education and Technology* (under review, 2000).

Shale, D. (1988). Toward a reconceptualization of distance education. *The American Journal of Distance Education*, 2(3), 25-35.

Table 1
Course Survey Data Collected from Students Enrolled in Online Histology (N=77).

Question	Response Number	Response Number	Response Number	Response
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	(Percent)	(Percent)	(Percent)	Number (Percent)
1) I found technical access to this online course:	very easy 51 (66%)	easy 24 (31%)	difficult 2 (3%)	what help? 0 (0%)
2) Most of the time, I accessed the course:	off-campus 50 (65%)	on-campus 27 (35%)	--	--
3) How academically challenging was this course?	very challenging 37 (48%)	challenging 33 (43%)	somewhat challenging 6 (8%)	no challenge 1 (1%)
4) How does this online course's level of academic challenge compare to that of most live lecture courses?	more of a challenge than most live lecture courses 29 (38%)	provided the same level of academic challenge as a similar lecture course 46 (60%)	less academically challenging than most live lecture courses 2 (3%)	--
5) Compared to live lecture courses, how does this online course rate overall?	higher quality than most live lecture courses 40 (52%)	same quality 34 (44%)	lesser quality 2 (3%)	--
6) How time consuming was it to complete assignments and master the material for this course?	very time consuming 26 (34%)	time consuming 41 (53%)	somewhat time cons. 9 (12%)	not time consuming 1 (1%)
7) How does the amount of time necessary to complete assignments and master material in the online course compare to most live lecture courses?	requires more time than most live lecture courses 33 (43%)	about the same amount of time 36 (47%)	less time 8 (10%)	--
8) How would you rate the overall quality of this course?	high quality 53 (69%)	above average 20 (26%)	below average 3 (4%)	poor quality 4 (5%)