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# Reuse of Web-Based Teaching Materials in IS Courses

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## Abstract

This paper describes the experiences of the author and other faculty members in a CIS department that encourages sharing of web-based teaching materials. This includes using materials developed by other faculty, and creating materials for others. These experiences indicate that such materials can increase productivity. Another benefit is that the materials make it easier to teach modules on topics in which the instructor has little or no previous experience. However the productivity gains are somewhat offset by the need to keep the materials up-to-date, and to adapt them to individual teaching philosophies. One weak link in this process is the lack of procedures for managing the materials and incorporating feedback based on classroom experience, and on discovery of additional relevant content.

## Introduction

The field of Economics distinguishes between two different methods of production: craft work and mass production. In craft work, products are created by skilled artisans who usually have responsibility for major parts of the process. The outputs are not standardized: both the quality and features can vary greatly depending on the producer. In mass production, the products are much more standardized and, with division of labor and economies of scale, productivity is much higher. All production was originally craftwork, but with improving technologies more and more work has been incorporating aspects of mass production.

On the other hand, education continues to be a form of craftwork. The development of writing made it possible to create permanent teaching materials, rather than continuing to rely on human memory and oral delivery of content. The development of the printing press made it possible to create permanent materials in greater volumes and at lower cost. In the 20th century audio-video materials became available, and many classrooms now have access to projection equipment. However the process still depends very heavily on instructors whose primary role is conducting classroom sessions. (It is safe to say that, with a translator, a scholar from thousands of years in the past--e.g., from the Golden Age of Greece--would have no difficulty in adapting his teaching to the typical university classroom.)

Under the current paradigm, the instructor has a meta-level role in relation to the course content. She typically

selects content from available textbooks, periodicals, and other sources. She also creates and delivers lectures, and selects or creates assignments to supplement and reinforce the assigned content. Finally, she provides feedback to the students based on their performance on the assignments.

This situation may soon change, based on the following trends:

- Technologies - computer technologies now make it possible to create content that is much richer than what is available in print media. Computer technology is also becoming more suitable for providing feedback to students. With these increased capabilities, there may be less need for traditional meta-level instructional activities. The Internet makes available a much wider selection of content, some of it in multimedia format. The Internet also makes it possible for instructors to perform meta-level activities with students who are not in the same place at the same time.
- Demand for education - technologies are not just a facilitator of change, they are also a driver. The increasing rate of change in the economy, largely driven by technology, requires knowledge workers to continue to learn new technologies to remain employable. The upsurge in population in the traditional college age range, in the context of public resistance to increased funding for education, is creating pressures for greater efficiency.
- Market competition - recognizing the impact of the above trends, various providers--for profit institutions, "corporate universities," extension programs of traditional universities, and textbook publishers--have been experimenting with new modes of creating and delivering educational content.

## Educational Material Reuse at Cal Poly

Education and software development are somewhat similar. They are both knowledge work, and they usually require adaptation to specific situations. Despite technological advances, much of the activity is still in the form of craft work. It is widely recognized that this mode of production results in a great deal of duplication of effort, but the lack of standards (Rada, 1997) represents an obstacle to software reuse. In higher education, "universities generate content every day ... Then they throw it away." (Tsichritzis, 1999)

The author's previous experience in teaching at six different colleges and universities was similar to the

norms in software development. In each of these situations, he had access to syllabi from courses taught by other faculty, and the department usually selected the textbooks. Beyond these, however, he was expected to function as a craft worker who developed or found teaching materials on his own.

When he joined the CIS department at Cal Poly, the author found that the faculty had developed web-based materials for many courses, and were eager to share them with new faculty members. The department chair very strongly encouraged him to use these materials, customizing them as necessary, rather than developing materials from scratch.

The author subsequently found that developing materials that others could use was a positive factor in retention, tenure, and promotion decisions. Conversely, failure to share materials was a negative factor. Reusable material development was originally based on the very collegial atmosphere within the department. However the trend accelerated when several faculty members started developing web-based materials for Internet-related courses, and sharing them with each other and newer faculty members. These informal activities worked so well that they evolved into informal but well-established department-level policies.

Course material reuse facilitates two of the objectives of the department:

- it makes it easier to rotate faculty with different skills and interests into new courses, so that there will be backup faculty to teach each course if the lead person goes on sabbatical or is otherwise unavailable. (This is especially important in the current environment of rising enrollment in IS courses, with a limited supply of new Ph.D.s to teach the added students.)
- it makes it easier for the department to keep its course offerings up-to-date with developing technologies. One faculty member can pioneer a course, and then others can use the material to reduce the learning curve in preparing to teach the new technology.

Cal Poly's excellent technological resources facilitate sharing course materials. Faculty (and students) can use their standard university intranet accounts to host web pages and PowerPoint presentations. The CIS department has its own small "server farm," which provides hosting for groupware and web pages that use ASP scripts. The College of Business has two industry-sponsored classrooms with multiple computers for instruction and group work. The students' and instructor's computers can be projected onto large screens in these rooms. The author's experience has been that these facilities have been highly reliable (the computers at each table of students made it possible for them to view the teaching materials on the one occasion that the projector failed).

In the author's first two quarters in this environment, he used materials developed by two other faculty members for a course in web site design and development. Although he had extensive previous experience with HTML and had done some work with JavaScript, he had very little experience with graphics software and had not used the authoring tool (Dreamweaver) that the department was using.

In his second quarter, the author taught a course that previously covered development of executive information systems (EIS), using active server pages (ASP) as the primary technology. Because of declining interest in EIS, the department suggested converting the course to coverage of E-commerce systems development technologies. He therefore created a course in which students use ASP to create shopping cart software for web sites. The projects also require them to connect their shopping carts to a database on a server. At the end of the quarter he introduced a module on developing XML versions of documents for business applications.

The author developed PowerPoint™ slides for most of his lecture material, and ASP and XML code samples for the students to study and work with. He placed almost all of this content on a web site for the students to access. He is using these materials in the current quarter, and refining them based on his experiences in the initial quarter.

## **Findings Concerning Course Material Reuse**

The author's experiences with reuse have been positive. Use of material developed by others has made it easier for him to present material on the Adobe Photoshop graphic software and advanced features of the Dreamweaver authoring tool, despite having no previous experience with either.

In addition to reflection on his personal experiences, the author circulated a questionnaire among the faculty regarding course material reuse. The overall rating of the concept of reuse was 4.6 on a 5-point scale (12 responses). Most of the respondents mentioned timesavings, efficiency, and "not reinventing the wheel" as advantages of reuse. One said, "If we teach reuse of code in object-oriented [programming], why not have reuse of classroom material?"

The author found that, even though reuse could save time, it was not a substitute for preparation. To teach unfamiliar content, he found that it was necessary to spend a substantial amount of time studying the previously developed materials and working with the software. In some instances, he had to find and study other materials on the topic, to achieve the necessary proficiency. However he would have had to do this even without these materials. Since these materials were

available, he did not have to develop the lecture notes and assignments that would have been necessary otherwise.

This preparation sometimes led the author to make minor corrections to the materials developed by others. In some cases it revealed additional or more up-to-date content, which he then incorporated into his copies of the materials. Since the modifications were usually minor, he generally did not refer them back to the original authors.

This lack of “version control” represents a possible flaw in the process. The materials are not being maintained on a centralized basis, so other faculty will not have access to all the updates and corrections unless they undertake the laborious process of sifting through the versions maintained by different instructors of the course. (One possible solution would be to have a “repository” for course materials, but this is unlikely to happen unless some faculty member volunteers for the time-consuming job of managing a central library of materials.)

Another reason for revising materials is differences in teaching philosophies. In his first quarter, the author used the four existing projects from a previous website development class. He found after receiving the completed assignments from the students that he needed to change the assignments to reflect what he felt were the most important issues. Throughout the first quarter, he found himself making more and more changes in each succeeding assignment. Since the assignments were specified in substantial detail, the revision process became increasingly time-consuming. By the end of the quarter, he was beginning to suspect that assignment reuse cost more time than it saved in this class.

The author suggests that anyone using previously developed course materials should allocate a substantial amount of time prior to the quarter, and prior to individual class sessions, to become familiar (or to refresh previous experiences) with both the material and any software that it covers. Well-designed materials can save time and increase productivity, but they may not compensate for inadequate preparation.

In relation to preparation, one of the respondents to the survey said “You don’t know the material as well as self-prepared [material], you end up reading the material [PowerPoint slides], which is boring.” Another said “I am a much more engaging speaker when I use my own material.”

The author’s exploratory survey indicated several other potential problems. The material may not fit another faculty member’s teaching style. Some faculty are very possessive of their material and do not like to share. Several respondents mentioned that students could also practice reuse, by turning in projects that other students

had done in previous quarters for the corresponding assignments.

## Observations on Developing On-line Course Materials

In the author’s first quarter he used materials developed by others. This initial experience provided some insights for the second quarter, when he developed a new course in E-commerce application development technologies. No other faculty member has used this material yet, so the author can only discuss this from his own perspective.

The first observation is that developing material for a new course, using newer technologies, requires a large amount of work under any circumstances. It is even more work to simultaneously create PowerPoint presentations, code samples and other materials, and then create and maintain a web site to house these materials.

On the other hand, the finished product is attractive and can serve as a showcase for one’s work. The author showed it to his department chair and received a favorable response, as well as a subsequent invitation to join a task force developing a new electronic-commerce curriculum. The author also included the URL in an evaluation package, and received favorable responses from the committee members.

This course material has been extremely helpful in the second (current) quarter in which the author is teaching this course. Since the bulk of the course development effort has been completed, he is now concentrating on refining and enhancing the material.

The author noticed in this class, and in the classes where he was using materials developed by others, that some students were printing out the PowerPoint slides and HTML documents. This indicates that they recognized value in this material.

In both situations, the author found the course web sites to be a useful reference to both the schedule and the content of the course. He used the web-published material as a checkpoint as he was developing exams, including adapting test items from previous classes to the content of these courses.

## References

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