

Assessing the Value of Computer Science Course Material Repositories

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Abstract

Finding new course materials is a continual challenge for computer science faculty. Although some free, online collections exist, they are largely under utilized. This study is a work-in-progress that examines the utility of these repositories via a survey of North American faculty. It explores both their current practices for identifying new course materials and probes their perceptions of online repositories. Preliminary results indicate both low visibility and marginal utility. Suggestions for improvement are provided.

1. Introduction

Finding course materials is an ongoing challenge for faculty in all academic disciplines. Those in rapidly changing disciplines, such as computer science (CS), have an especially daunting task to stay current. Although many diverse resources exist, such as textbook supplements and online quiz banks, faculty must sift through to identify appropriate course materials, all the while being vigilant with regard to the quality and reliability of what they find.

Centralized, no-cost, online repositories of CS course materials are one potential solution to this problem. Indeed, some have been developed (e.g., CITIDEL [1], CSTC [2], and SWENET [3]). There are also broader initiatives underway, such as MIT's OpenCourseWare [4] project. Despite their existence and ongoing evolution, CS repositories appear under utilized [5, 6].

There are several possible explanations for this under utilization. Firstly, CS repositories may not be well known to potential users. Secondly, many are new and it takes time to establish a trustworthy reputation. Thirdly, interface issues may prove critical, such as ease of navigation. Lastly, repositories must achieve a critical mass of desirable content to be viable. The intent of this study is to probe this under utilization problem and assess the value of CS repositories.

2. Study Design

Our research began with the distribution of a survey to faculty who teach CS courses throughout the United States and Canada. The 27 question instrument contained four sections: 1) the procedures and resources that faculty members now use to find new course materials, 2) their experiences with online course material repositories, 3) the features that they consider to be critical in such repositories, and 4) demographic information. Questions were primarily Likert scale and ordered ranking formats with optional open-ended response categories

The survey was piloted in the Computer Science and Electrical Engineering Department at the University of Maryland, Baltimore County (UMBC) with 14 full-time and three adjunct faculty members. This process identified problems in the wording of three questions and the primary skip pattern, which were corrected.

The final survey was initially distributed to the attendees of the SWENET 2005 workshop and the 2005 Conference on Software Engineering Education and Training (CSEE&T). These participants were asked to send the survey to colleagues at their home institutions. Combined, 47 responses were received. Next, a survey invitation was posted on the ACM Special Interest Group on Computer Science Education (SIGCSE) listserv, resulting in 111 additional

responses. To further increase the demographic diversity of the sample, the authors contacted twelve community college faculty members, receiving eight additional responses.

The survey data set was cleaned, primarily removing incomplete responses. Participants outside the United States and Canada were removed to control for variations in educational systems. This resulted in a final data set of 119 responses. Sensitivity analysis between the three major participating groups (SWENET, CSEE&T, and SIGCSE) was performed and, in general, no remarkable differences were noted. The results reported in this paper are preliminary and consist of descriptive statistics only. This survey is a work in progress, the results of which will help inform the design and redesign of repositories to better meet the practical needs of the computer science and information technologies educational community.

3. Preliminary Analysis

3.1. Target Repository Population

The study population exhibited diversity in several key areas. There was a reasonable representation of public and private institutions (59% and 41%, respectively) of all sizes. The majority of faculty were full-time (92%), research (69%), and tenure track (86%), but with fair representation from the non-research and non-tenure track categories. Respondents also tended to be experienced teachers, with 59% having taught computer science for eleven or more years. The most commonly taught topic areas [7] trended towards the programming and software engineering aspects of CS. Given the three major response populations, it is reasonable to assume that they have a pedagogical interest and software engineering orientation.

3.2. Locating New Course Materials

Six questions were asked concerning faculty habits in locating new CS materials. Emphasis was placed on search procedures and common resources employed. Each was worded as, “In the last three years, ... “ to minimize problems with recall. **Course design is an evolutionary process and one would expect that faculty commonly update their course materials. Our results revealed that 91% of the faculty surveyed have made minor changes (e.g., creating a new homework assignment) to existing courses two or more times in the last three years. In addition, 86% have made major changes (e.g., adding a new lecture) to existing courses.** Although designing a course from scratch was not as frequent, 58% of the faculty members have done so. Changes in course design, from minor to drastic, looks to be frequent enough to justify the need for specialized resources such as repositories.

The scope of the materials for which instructors search covers a wide range. We found that they search for materials for a single topic (e.g., recursion), content for a single class meeting, and for individual items (e.g., a set of lecture notes, a quiz, or an exercise), quite frequently (90%, 89%, and 85%, respectively). The desire to locate materials for an entire course was much less frequent (63%), but not insignificant.

The types of materials that faculty wish to locate lean towards references and examples and away from student evaluation and audio-visual items. The most common types of course materials searched for were textbooks, articles for students to read, problem samples, program code samples and student out-of-class exercises. Interestingly, the two least common items were exams and quizzes, items that are pervasive throughout CS course syllabi

There are multiple procedures that faculty use to locate new course materials. Respondents indicated high satisfaction with four of the five listed in the survey (see Figure 1). This finding questions the demand for supplementary resources such as repositories.

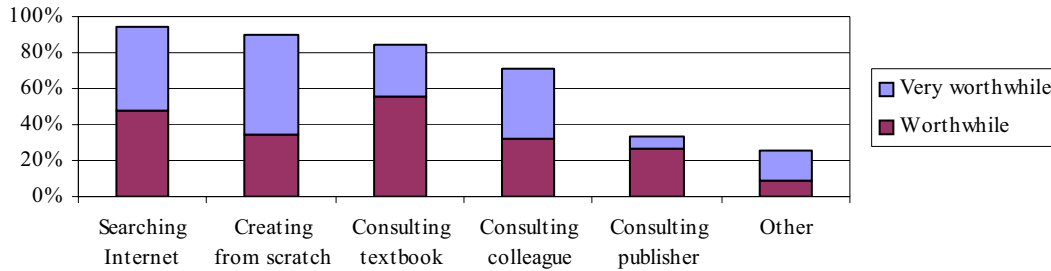


Figure 1. Effectiveness of Location Procedures

In addition to the above procedures, respondents employed many types of resources when searching for new materials. Our survey explored four categories of resources: physical materials (e.g., textbooks), physical repositories (e.g., a department's collection of materials), online repositories, and Internet sites (e.g., an individual's course website). Textbooks (not including their supplements) were by far the most commonly consulted resource (91%). Although repositories, both physical and online, were far behind (6% to 48%), other Internet resources, such as other individuals' course websites, were fairly frequently used (43% to 65%).

The survey results demonstrate that faculty make frequent changes, both minor and major, to their courses and require all types of materials. These are primarily references and examples rather than student evaluation tools and audio-visual aids. Interestingly, most are fairly satisfied with the search methods they use and rely heavily on materials from textbooks and non-repository websites.

3.3. Repository Use

Before exploring repository use, we needed to establish faculty awareness of existing repositories. We found that 81% of respondents are aware of general online academic course material repositories. However, when asked if they had ever used one for locating computer science course materials, only 54% responded in the affirmative. Of the 46% who had not used a repository to locate CS materials, 90% said that they would be interested in trying one.

Given the small percentage of faculty who had used computer science course material repositories, apt marketing approaches are essential. By far, the most common means of becoming aware of repositories were through attendance at a conference or workshop (34%), via an Internet search (26%), and by communication with a professional colleague (23%).

Of those who had used a repository for locating CS course materials, their experiences were almost always disappointing. None indicated that the use of a repository always met their needs, 9% indicated their needs were almost always met, 62% indicated that they were sometimes met, 24% indicated that they were seldom met, and 5% indicated that they were never met.

The general pattern that emerged regarding repository use was that the majority of faculty surveyed knew that they existed, but few had used them to locate CS course materials. Those who had used them were mostly dissatisfied with the experience.

3.4. Repository Features

Participants were asked what they perceive as the critical features of a CS course material repository. Figure 2 below gives the five features ranked as the most critical.

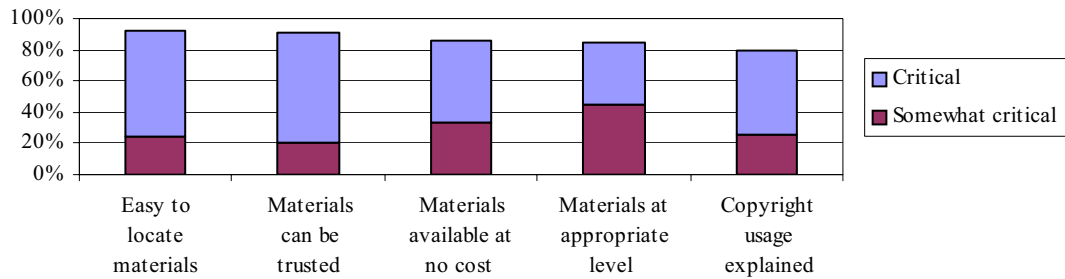


Figure 2. Most Critical Features for CS Repositories

These five features ranked considerably higher than the remaining eight features in the list. Faculty were far less concerned with guidelines for student assessment, teaching tips for the use of materials, feedback from users of specific repository materials, and feedback from users regarding the repository as a whole. In summary, respondents were more concerned with the integrity of the repository and its ease of use than with its pedagogical support.

4. Conclusions and Future Work

Our study supports the premise that computer science course material repositories are under utilized, even though the demand for these materials is high. It identifies low visibility for CS repositories as a primary cause. Higher visibility could be attained through both a greater Internet presence and increased advertising at professional conferences and workshops.

The study also noted that most faculty members are not actively looking for repositories and that those that are generally find them to be of limited use. At the same time, their success rate in locating materials by other means (e.g., Internet searches and textbook consultation) is high. This poses the question as to whether or not course material repositories are actually useful tools warranting further development.

Nonetheless, faculty indicated concerns regarding the trustworthiness of materials and the difficulty in finding them. Therefore, a structured and controlled means for course material storage and retrieval may still be appropriate and the repository model should not be dismissed. Follow-up interviews with select survey respondents is planned to further investigate faculty course preparation activities. This will yield additional understanding of this tension and inform the suitable design of course material repositories for CS and related disciplines.

5. References

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