Course Mentoring: Toward Achieving Consistency in the Curriculum

Lucia Dettori
ldettori@cti.depaul.edu

Amber Settle
asettle@cti.depaul.edu

School of Computer Science, Telecommunications, and Information Systems
DePaul University, Chicago, IL 60604 USA

Abstract

One the main challenges in achieving consistency in the curriculum is the delivery and coordination of multi-section introductory courses. The mix of adjunct, new, and seasoned instructors, the frequent changes in course content and learning goals, and the non-homogeneous student body are some of the factors that makes successfully teaching such courses a challenge. In this paper we describe how the course mentoring project combines personal involvement with a technological solution to build an effective knowledge-sharing virtual community. Course mentoring has proven to be an efficient way to address and overcome the challenges of teaching introductory computer science courses.

Keywords: Faculty mentoring, knowledge-sharing community, curriculum development, introductory courses

1. INTRODUCTION

Many large universities face difficulties maintaining consistent course content in classes with multiple sections. This is particularly true for introductory courses such as calculus and programming languages, courses that tend to be taught by either faculty new to the institution or by adjunct faculty. Both populations may not be as aware of on-going curricular development or course histories as other more permanent and experienced faculty. It is crucial to try to make such faculty aware of the standard teaching methodologies, the concepts that must be taught and those that are optional to the course, the student population they can expect to see, and where the course fits into course sequences in various degree programs. All of these tasks become more difficult during times of significant growth in the fulltime faculty body, at institutions where a large number of introductory courses are taught by adjuncts, or in the area of information technology where curriculum changes are frequent and on-going. The course mentoring project described in this article was developed to address the issue of content consistency and delivery in introductory computer science courses.

Many companies and institutions use information technology to facilitate the sharing of knowledge and best practices. Technology can be used to seed the development of a knowledge-sharing community. A good example of this is the Electronic Community of Teachers (ECOT) created by the Center for Technology in Teaching and Learning at Rice University. ECOT provides a software environment that gives teachers e-mail, discussion areas, individual and group calendars, chat rooms, and asynchronous forums (Brazelton and Gorry 2003). While it has been found that the success of a knowledge-sharing community can depend on institutional incentives or mandates (O'Dell and Grayson 1998), the ECOT has proven successful without any such incentives. In two years over 800 teachers have joined, and 60% of the members use it at least once a week (Brazelton and Gorry 2003). It is precisely the distributed and self-organizing nature of the ECOT example that provides a unique solution to the issue of coordinating curriculum across multiple sections at a single institution.

Another example is the Course Director program at the United States Military Academy at West Point (USMA 2004). The Academy recently went through a substantial curriculum restructuring and now requires all cadets, independent of their chosen major, to take an introductory information technology course (IT 105 Introduction to Computing and Information Technology) in their freshman year. This results in at least 20 sections of the course being offered each Fall. Course content, delivery and assessment, including common quizzes and final exams, are coordinated by a Course Director appointed by the Dean (Jackson 2004).

Given the number of sections and the foundation role of the course, having a course director has proven to be a key factor in the success of IT 105 and the follow up required course IT 305 Theory and Practice of Military Information Technology Systems.

2. BACKGROUND AND MOTIVATION

In this section we describe the motivation for the course mentoring project, including the factors that led to its creation and way in which the idea was developed.

Background

The School of Computer Science, Telecommunications, and Information Systems (CTI) was established in 1996, growing out of the Department of Computer Science in the School of Liberal Arts and Sciences at DePaul University. When it began, CTI employed 30 fulltime faculty members, 20 adjunct faculty, served over 1800 students (DePaul OIPR 2004), and offered 80 course sections (Miller 2004). From 1996 – 2002, CTI experienced enormous growth. At one point during the peak of the growth period, graduate enrollments were increasing by 30% each quarter. The hiring of full-time and part-time faculty grew at a comparable rate, resulting in a high percentage of junior and first-time instructors. CTI is now the largest and most diverse institution for information technology education in the United States. Over 40% of all graduate students in Illinois studying information technology are enrolled at CTI. CTI currently has over 3500 students, offers 250 sections each quarter (Miller 2004), and employs approximately 80 fulltime faculty members and over 100 adjunct faculty members (DePaul CTI 2004). CTI offers 9 Bachelor's of Science degrees in a variety of disciplines, from traditional Computer Science to Information Technology, Gaming, and Digital Cinema, 2 Bachelor's of Art degrees and two joint degrees with other Schools at DePaul. Five of the 13 degrees were added just in the last year. CTI also offers a host of Master's degrees which use some of the undergraduate courses in their prerequisite phase.

With so many faculty and course offerings and a rapidly changing curriculum at CTI, consistency in course content is a challenging issue. For example, in the Fall 2002 quarter CTI offered 22 sections of the introductory course in Java programming. Typically, introductory courses are taught by a mix of adjunct and fulltime faculty and also tend to attract faculty who are new to CTI, as these courses have few prerequisites and cover conceptually simpler material. The combination of a large number of sections and a very diverse set of faculty teaching has led to inconsistencies in the coverage of material in certain courses. This is particularly troublesome for courses that belong to a sequence, such as the Java programming courses, both because these courses build on material in previous courses and because these courses are so prevalent in the programs offered at CTI. As an example, virtually every student, undergraduate or graduate, must take the first quarter of Java programming and the majority of students are required to take two Java courses. Inconsistencies in course presentation, the level of material covered, and the topics required in the course can have serious consequences.

The Origin of Course Mentoring

In 2002, CTI held its second faculty retreat. The purpose of the retreat was to acquaint new faculty with the older members of the School and to allow all faculty to come together and identify both current and future challenges for the School. In preparation for the retreat, white papers were written on a variety of subjects deemed important to CTI. The white papers were designed to provide a starting point for discussion at the retreat.

One of the white papers concerned the problem of ensuring that the content of courses be consistent. The problems identified were precisely the ones mentioned earlier in this section: a diverse faculty body teaching courses with a large number of sections situated within a curriculum updated on a yearly basis. The white paper identified solutions that had been suggested to solve this problem up until that point. These included common course syllabi, common course exams, a centralized site for maintaining course materials, faculty monitors to identify and correct problems with inconsistency, and improved evaluation procedures to enforce consistency. The common problem with all of these ideas, as was noted in the white paper, is that each involves a significant amount of work on the part of individual faculty members. Further, many of the ideas, such as common syllabi and exams, are cumbersome in an institution as large and diverse as CTI. Indeed, each idea generated nearly as many problems as it was designed to solve.

The faculty who worked on this topic at the retreat quickly identified that any solution to the consistency problems at CTI would need to have three characteristics. It would need to be scalable, so that it could be implemented in the tens of introductory courses offered at CTI every quarter. The solution would need to be decentralized, so that the burden of implementation for the system would not fall to just a few individuals. And the solution would need to be flexible, able to change quickly with minimal effort as the curriculum was updated. The faculty working on the issue at the retreat drew up an initial plan for a solution, which would eventually be called the course mentoring project.

3. COURSE MENTORING

As stated in the section above, the goal of the course mentoring project is to implement a flexible, scalable, and distributed mechanism for coordinating and overseeing the teaching of courses with large numbers of sections. The central idea is that critical courses at

CTI will be assigned a course mentor. A course mentor is ideally a fulltime faculty member who has taught the course recently and who can serve as a contact person for all instructors teaching the course during a given quarter. For the purposes of continuity, the course mentor should agree to serve for one academic year. Also, a single faculty member should not serve as a course mentor for multiple courses.

The responsibilities of the course mentor, as the project was originally conceived, included setting up and maintaining an internal course Web site. The details of what that site were to contain is described in the next section. The course mentor was also charged with staying in direct contact with all instructors for the course. This includes both fulltime and adjunct faculty, with an emphasis on faculty who have not taught the course previously. The details of what was expected for each category of faculty are described below.

It should be noted that the course mentor is not in charge of determining what the content of a specific course should be, or dictating how the content should be delivered. The primary role of a course mentor is to facilitate and coordinate the teaching of the course as designed by the appropriate committee. As mentioned before CTI offers a variety of degrees in many computer-related fields but it is unique in the fact that it is not composed of separate departments. While this fluid structure has several advantages it also presents a challenge for curriculum development and monitoring. The debate on this issue at the 2002 faculty retreat resulted in the creation of Program Committees for each area in which CTI offers a degree. These non-departmental entities are responsible for overseeing course content and curriculum development. In addition, an Undergraduate Common Core Committee oversees all shared introductory courses, to ensure that they serve all intended degrees. The course mentor is one of the many players making sure that the guidelines from the relevant committees are followed "in the field."

4. CURRENT IMPLEMENTATION

To facilitate the implementation of course mentoring for as many courses as possible, the authors worked with the CTI web development team to create password protected, dedicated course web sites using Microsoft Share Point Team Services collaborative development tool (http://www.microsoft.com/sharepoint/). Over 60 sites were created covering most of the courses offered at CTI. To improve usability and reduce the course mentor workload, each site was initially organized according to a common framework described hereafter, and was automatically populated with some basic information like textbook and official syllabus. The course mentor is free to customize the site to meet the needs of a specific course.

The sites supporting course mentors are organized as follows:

- A course guideline section to store detailed learning goals, official syllabus and an outline of the week by-week topics coverage.
- A repository section for sharing course material. Previous instructors are encouraged to volunteer their course notes, sample homework assignments, and other relevant examples.
- A discussion board to be used by present and past instructors to discuss the effectiveness of teaching tools, share teaching tips and solicit input and feedback on any issue arising while teaching the specific course
- A section of useful links to textbooks, tutorials and other material for the benefit of instructors and students.
- A collection of case studies relevant to the course to serve as a resource for first time instructors. The list is also useful to instructors teaching follow up courses to avoid reusing examples and reduce redundancy.
- A section with information about the Graduate Assessment Exam (GAE) for courses that serve as prerequisite for Master programs. Note that the GAE exist to allow graduate students with background in a topic covered by a prerequisite course but no formal training to demonstrate their knowledge of the material. Students who pass the GAE for a course are not required to complete the course.
- A list of current and past instructor including their contact information.

The course mentor is responsible for populating and maintaining the various sections of the course website, and soliciting material submissions from other faculty members. The use of a collaborative environment like Share Point Team Services plays a key role in the success of a knowledge-sharing community as it significantly simplifies the submission process and facilitates open discussion among faculty members. In addition, any faculty member at CTI can register with the site to receive an email alert when changes are made to the site and the course mentor has the option of sending out electronic invitation to any subgroup of the CTI community.

Other responsibilities of the course mentor include calling a meeting of past and present instructors before the beginning of a new quarter to discuss the details of the course and allow new instructors to get first hand input from veteran instructors. This meeting gives first-time instructors a better sense of where the course is positioned in the degrees, what purpose it serves, especially in relation to follow up courses that build and count on the material coverage.

At the end of each quarter the mentor reconvenes the group to gather feedback and discuss what worked and what didn't work in teaching the course and come up with an updated set of guidelines for the following quarter. As a result of these meetings the mentor is able to continuously update the list of best practices and the progressive collective knowledge about teaching the specific course is preserved and propagated throughout the community at large.

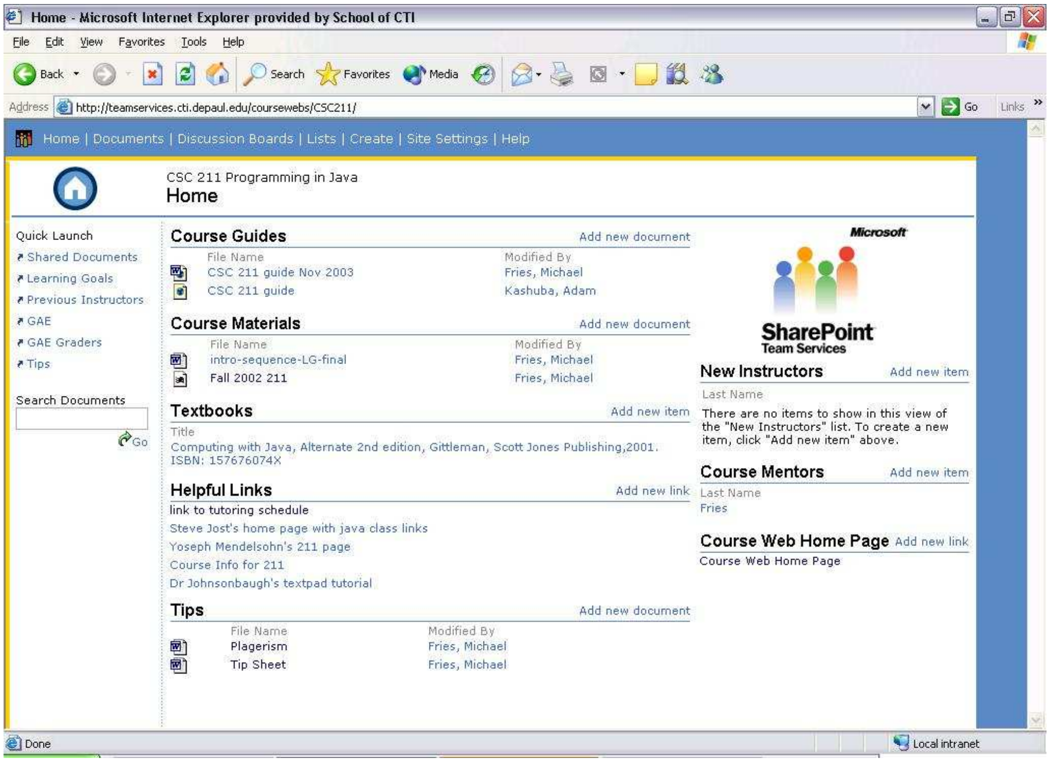
The effectiveness of course mentoring relies heavily on the enthusiasm and determination of the volunteer mentor. Approximately 50% of the courses initially identified as needing a course mentor have active sites.

Two examples of successfully mentored courses at CTI are: CSC 211 Programming in Java I and IS 315 Analysis and Design Techniques. Figure 1 and 2 reproduce a snapshot of the course mentoring sites for CSC 211 and IS 315 respectively.

Both courses play a key role in CTI curricula for different reasons. CSC 211 is the foundation of the programming in Java sequence but serves a variety of students, from traditional undergraduates that have had some programming experience in high school to professionals having never programmed before and retraining for a career change (Gittleman 2002). The introductory nature of the course also makes it an attractive course selection for new faculty just starting at CTI. IS 315 is a service course for many degrees and plays a different role in each of them. The course presents a practical approach to systems analysis and design using a blend of traditional development with current technologies (Shelly, Cashman, and Rosenblatt 2003).

The diversity of student backgrounds and expectation makes teaching these courses particularly challenging and the need for coordination by a course mentor even more critical. Both sites have been quite active and contain a comprehensive range of teaching support material. This includes: detailed articulation of the learning goals, multiple complete sets of lecture notes organized by weeks, or by topic, several example of homework assignments, quizzes and other assessment material, a detailed list of case studies used over several sections, and informal documents containing tips, observations, and best practices about the course and the audience.

One of the authors was assigned to teach CSC 211, a course she had never taught before, shortly after the course mentoring project was launched. As a first–time instructor for CSC 211 she had a chance to test the effectiveness of course mentoring first hand. In line with what other first-time instructors reported, having a course mentor had a significant positive impact on the course preparation and played a key support role throughout the quarter. The two most important factors were the direct, structured, communication with the mentor and previous instructors, and the extensive material available on the site. Group discussion and the best practices documents provided a clear picture of the role of the course within the sequence and the various


Home - Microsoft Internet Explorer provided by School of CTI
File Edit View Favorites Tools Help
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Home | Documents | Discussion Boards | Lists | Create | Site Settings | Help
Quick Launch
Shared Documents
Learning Goals
Previous Instructors
GAE
GAE Graders
Tips
Search Documents
Go
Microsoft
SharePoint
Team Services
Done
Local intranet

http://teamservices.cti.depaul.edu/coursewebs/CSC211/

CSC 211 Programming in Java
Home

Course Guides — Add new document

	File Name	Modified By
	CSC 211 guide Nov 2003	Fries, Michael
	CSC 211 guide	Kashuba, Adam

Course Materials — Add new document

	File Name	Modified By
	intro-sequence-LG-final	Fries, Michael
	Fall 2002 211	Fries, Michael

Textbooks — Add new item

Title
Computing with Java, Alternate 2nd edition, Gittleman, Scott Jones Publishing,2001. ISBN: 157676074X

Helpful Links — Add new link

link to tutoring schedule
Steve Jost's home page with java class links
Yoseph Mendelsohn's 211 page
Course Info for 211
Dr Johnsonbaugh's textpad tutorial

Tips — Add new document

	File Name	Modified By
	Plagerism	Fries, Michael
	Tip Sheet	Fries, Michael

New Instructors — Add new item

Last Name
There are no items to show in this view of the "New Instructors" list. To create a new item, click "Add new item" above.

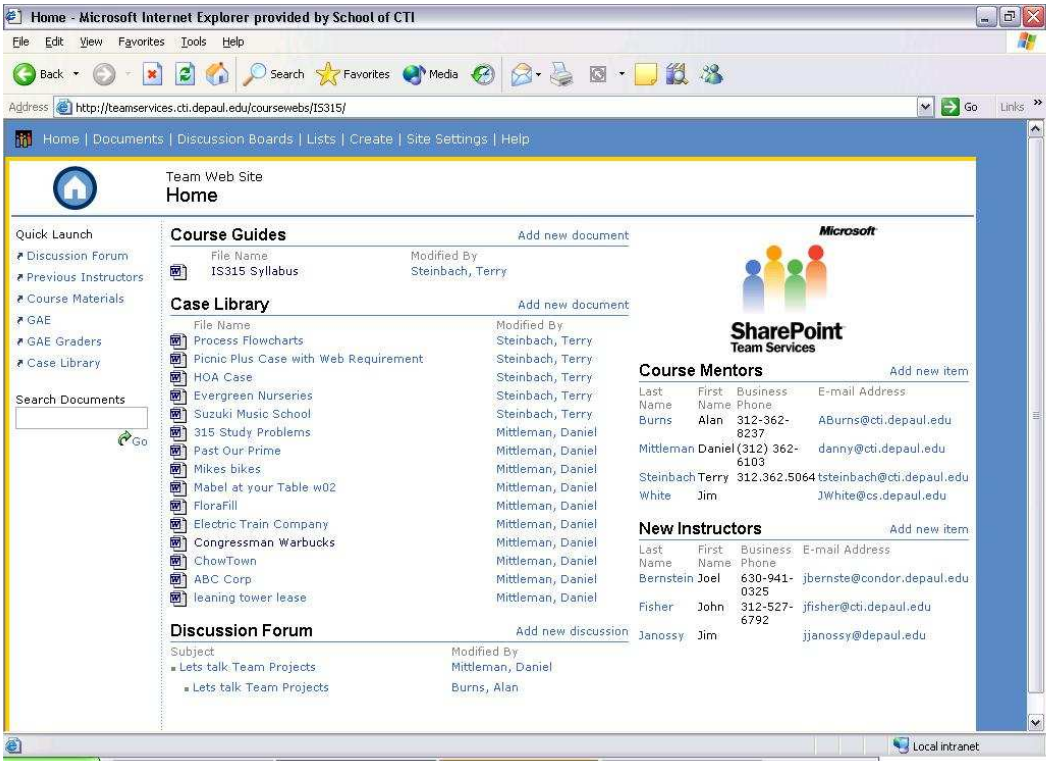
Course Mentors — Add new item

Last Name
Fries

Course Web Home Page — Add new link

Course Web Home Page

Figure 1 CSC 211 - Course Mentor Web Site


Home - Microsoft Internet Explorer provided by School of CTI
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://teamservices.cti.depaul.edu/coursewebs/IS315/
Go Links
Home | Documents | Discussion Boards | Lists | Create | Site Settings | Help
Microsoft
SharePoint Team Services
Local intranet

Team Web Site
Home

Quick Launch
- Discussion Forum
- Previous Instructors
- Course Materials
- GAE
- GAE Graders
- Case Library

Search Documents
Go

Course Guides — Add new document

File Name	Modified By
IS315 Syllabus	Steinbach, Terry

Case Library — Add new document

File Name	Modified By
Process Flowcharts	Steinbach, Terry
Picnic Plus Case with Web Requirement	Steinbach, Terry
HOA Case	Steinbach, Terry
Evergreen Nurseries	Steinbach, Terry
Suzuki Music School	Steinbach, Terry
315 Study Problems	Mittleman, Daniel
Past Our Prime	Mittleman, Daniel
Mikes bikes	Mittleman, Daniel
Mabel at your Table w02	Mittleman, Daniel
FloraFill	Mittleman, Daniel
Electric Train Company	Mittleman, Daniel
Congressman Warbucks	Mittleman, Daniel
ChowTown	Mittleman, Daniel
ABC Corp	Mittleman, Daniel
leaning tower lease	Mittleman, Daniel

Discussion Forum — Add new discussion

Subject	Modified By
Lets talk Team Projects	Mittleman, Daniel
Lets talk Team Projects	Burns, Alan

Course Mentors — Add new item

Last Name	First Name	Business Phone	E-mail Address
Burns	Alan	312-362-8237	ABurns@cti.depaul.edu
Mittleman	Daniel	(312) 362-6103	danny@cti.depaul.edu
Steinbach	Terry	312.362.5064	tsteinbach@cti.depaul.edu
White	Jim		JWhite@cs.depaul.edu

New Instructors — Add new item

Last Name	First Name	Business Phone	E-mail Address
Bernstein	Joel	630-941-0325	jbernste@condor.depaul.edu
Fisher	John	312-527-6792	jfisher@cti.depaul.edu
Janossy	Jim		jjanossy@depaul.edu

Figure 2 IS 315 Course Mentor Web Site

degrees it serves, as well as some insights on what the major hurdles are for the students. Week-by-week syllabi and lecture notes helped set the correct pace for the course. Examples of quizzes, homework assignments and other assessment material were critical in setting reasonable goals for students' work and competence level. An informal survey of new instructors mirrors the author's experience and shows that they found the sites and the course mentors to be very useful in preparing and delivering their class.

Populating a course site for the first time, including soliciting and organizing the course material from all instructors clearly constitute the bulk effort on the part of a course mentor. However, given the fluid structure at CTI, it would not be possible to fully rely on instructors to voluntarily keep the site up to date over multiple quarters. The large number of faculty teaching introductory courses, and the variety of degrees building on such courses fuel a false sense of shared responsibility which often results in a lack of direct involvement. It has become clear over the last year that coordination and leadership on the part of a course mentor is a necessary condition toward achieving consistency in the curriculum. In particular, the course mentor during the academic year 2003-2004 left CTI during the summer 2004. During that time the Undergraduate Common Core Committee decided to switch from Java 1.4 to Java 1.5 in the labs. Unfortunately, although numerous faculty teaching CSC 211 were on that committee, no one communicated the desire for a switch to the technical staff responsible for maintaining lab software. This is just one example of why strong leadership from the course mentor is so crucial.

5. CONCLUSIONS AND FUTURE WORK

The majority of CTI faculty recognizes the value and benefits of course mentoring, especially for multiple section courses and courses that are part of a sequence. In particular, the CSC 211 course mentor and site have had a strong influence on the introductory programming sequence in the 2003-2004 academic year. The Undergraduate Common Core Committee agreed to adopt CodeLab, an online tutoring system (CodeLab 2004), for use in all sections of 211 during the year. Unfortunately, the CodeLab site experienced problems with high traffic during the early weeks of fall 2003. Because there was such close communication between instructors of 211, facilitated by the 211 course mentor, the problems with the system were quickly identified, communicated to the Turings Craft staff, and the use of CodeLab was halted for the remainder of the quarter. Had the course mentor not been involved, many more students would have been negatively impacted by the glitch on the site, significantly decreasing student satisfaction with CTI.

The size of the CTI faculty, the wide variations in people's schedule, and multi-campus nature of CTI does not facilitate frequent in-person meetings with the course mentor. As a result the main vehicle for information exchange is the course mentoring web site.

Feedback from the faculty have highlighted that one of the key aspects for the success of course mentoring is the quality of the material available on the site, and the flexibility of access to such information.

While first time instructors are interested in the material in its entirety, more seasoned professors' interaction with the site is significantly more focused. They are looking for innovative ways of teaching a particular concept, examples of assignments that test specific learning goals, or other assessment material.

The current folder-based organization of information is not optimal in this regard. We plan to develop a better knowledge management system that will make it easier to tie the submitted material to specific subtopics or learning goals and add more sophisticated search capabilities to the system. Ideally the system will be database driven and the annotation of the material will be facilitated by requesting more information at submission time in combination with some type of parsing algorithm.

The design and development of such system into the more sophisticated knowledge management tool could be incorporated as part of a capstone project for our bright undergraduate students. The improved system could be used for other applications and could be shared with other departments facing similar problems, for example, the coordination of multiple sections of calculus in the Mathematics Departments. The authors are investigating funding opportunities to be able to include undergraduate students in this research project.

While the pilot program has proven very successful, and the creation of the Team Services course web site framework has reduced the course mentor work load, being a course mentor still requires a significant amount of time, making finding volunteers for these positions the main challenge. This is consistent with the findings of other researchers who have implemented knowledge-sharing systems where the participation of "knowledge stewards" was crucial for success (Brazelton and Gorry 2003). Finding a way to motivate participants while keeping the system distributed and self-organizing is a challenge. Ideally, we would use a more top-down approach for motivation, rewarding course mentors with a reduced teaching load, financial compensation, or other concrete rewards. Unfortunately, there is little support for this approach on the part of the CTI administration, particularly given that CTI has been forced to cut its budget in recent years. A significant hurdle in making the course mentoring project a complete success continues to be finding a way to motivate participants without any direct rewards for their efforts.

6. ACKNOWLEDGEMENTS

We would like to thank Gian Mario Besana, Raffaella Settimi, Henry Harr, Adam Kashuba, and Michael Dain for their work in creating and implementing the course mentoring project. Thanks also go to Michael Fries and Terry Steinbach for their active participation in the course mentoring project.

7. REFERENCES

Brazeton, Jessica and G. Anthony Gorry, 2003, "Creating a Knowledg-Sharing Community: If You Build It, Will They Come?." *Communications of the ACM* **46**(2): 23-25.

CodeLab, 2004. www.turingscraft.com .

DePaul University, Office of Institutional Planning and Research, 2004. http://oipr.depaul.edu.

DePaul University, School of Computer Science, Telecommunications, and Information Systems, 2004. http://www.cti.depaul.edu.

Gittleman, Art, 2002. Computing with Java: Programs, Objects, Graphics, Alternate Second Edition. Scott Jones Publishers.

Jackson, James, 2004, USMA, Personal Communication.

Miller, David, 2004. Personal Communication.

O'Dell, C. and C.J. Grayson, 1998. If Only We Knew What We Know: The Transfer of Internal Knowledge and Best Practice. The Free Press.

Shelly, Gary B., Thomas J. Cashman, and Harry J. Rosenblatt, 2003. Systems Analysis and Design, Fourth Edition. International Thomson Publishing.

United States Military Academy at West Point, 2004, http://www.usma.edu/