LESSONS LEARNED FROM THE TRENCHES: SUCCESSFUL DESIGN OF ONLINE IT COURSES FOR HIGH SCHOOL STUDENTS

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Abstract

As high schools begin to offer more distance learning courses, universities have an opportunity to establish partnerships to deliver online IT courses. Delivering online courses at the high school level, however, means overcoming obstacles that may not be faced at the university level. In particular, establishing partnerships with high schools requires politically savvy navigations of bureaucratic roadblocks while ensuring the integrity of course content and delivery. This paper provides a primer on establishing relationships with high schools to deliver college-level IT curriculum to high school students in an asynchronous learning environment. We describe the curriculum introduced and discuss some of the challenges faced and the lessons learned.

Keywords: Distance education, high school students, information technology

Introduction

In this paper, we describe the CyberTech I program, an NSF-ITEST funded initiative which delivers university level introduction to IT curriculum online to nine schools in a large metropolitan area. Delivering online curriculum to high school students provides university educators with unique challenges. Unlike the college environment, in which professors have local autonomy over curriculum delivery and instruction, public high school curriculum has rigid standards that must be achieved, along with guidelines on methods of delivery. Forming a politically savvy team aware of how to navigate the high school environment is a must for ensuring successful establishment of partnerships.

Background

IT-related courses often fall under "Career and Technology Education" or "Business Education" departments in high schools. This positioning gives IT courses a distinctly different and typically lower regarded position from other mathematics and science courses. Often, students encouraged to take career and technology education courses select a non-college-prep track. Moreover, since many of the teachers in these departments have a primary background in business, they may find it difficult to teach an advanced IT course, leaving students unable to take more advanced courses, such as AP Computer Science, at their own schools.

In January 2005, we partnered with nine schools in a large metropolitan area to deliver an online introduction to IT course to high school students. Partnerships to deliver IT-related courses in the high schools have previously proven successful in Finland (Grandell, 2005), where five different college-level courses were offered at the high school level. Moreover, a community college in Pennsylvania successfully partnered with high schools to offer college-level computer information systems courses with significant success (Harvey, 2004). In addition to the goodwill established between high schools, students, and universities, programs such as these offer the ability to expand curriculum offerings at high schools significantly (Donlevy, 2003). Since 25% of public high schools have distance learning alternatives, and 19 states have virtual high schools (Mupinga, 2005), partnerships between colleges and high schools may become more commonplace. Distance learning has even expanded into the elementary level in some cases (Anastasiades, 2003), with a great deal of success.

After establishing a partnership with one or more schools, we then had to decide which online learning program to use. We debated upon WebCT CE, Blackboard, and Moodle. We needed to use a flexible, Web-based learning management system for several reasons. First, some of the schools were unable to offer the course during the regular school day. Therefore, we needed an asynchronous method to communicate with students on a 24/7 schedule. Second, those schools who did offer the online class during the regular school day met at different times and in different locations. Obviously, Web-based solutions offer the ability to reach a geographically dispersed population at different times.

CyberTech I Program

The initial 75-hour phase of CyberTech I was delivered entirely on-line by university faculty to students in their high schools in school computer labs as well as to students in their homes. We decided upon Blackboard for course delivery since many of the high schools participating in the program already used and were familiar with this platform. The largest participant in the program insisted that we use Blackboard as the delivery mechanism if we wanted them to be part of the program.

Funding for the CyberTech program was provided through an NSF-ITEST grant (#0423576). The grant included stipends for high school teachers who assisted the students (Site Facilitators), course releases for participating faculty members, funding for graduate teaching assistants, and Blackboard fees for students. Students participating in the program received all materials and services free of charge, as did the schools involved. Each school agreed to provide a Site Facilitator and, where possible, a classroom devoted to CyberTech I students. The next section describes the CyberTech I curriculum delivered.

Curriculum and Student Selection

As the students' first IT course, the curriculum focused on the basics of computing and how the technology is used. The curriculum for the CyberTech I spanned the following subject areas: 1) The computer (hardware, software and how computers execute software); 2) problem solving, algorithm design, introduction to programming languages, abstract data types, operating systems, artificial intelligence, networks, simulation, software (including spreadsheets and databases) and the Internet. Also, we introduced students to legal and ethical issues in computing as well as information security and forensics. The course materials included a very readable textbook (Dale & Lewis, 2003) and a computing laboratory manual (Meyer, 2003) as supplements to the on-line curriculum. Jones & Bartlett Publishers graciously donated the textbooks and the accompanying laboratory manual and CDs to support the program.

Our CyberTech I program mapped to the Quality Core Curriculum (QCC) standards established by the Georgia Department of Education for IT Foundations 11.412, an existing high school course. Therefore, students were eligible to receive high school credit for the course. Further, students who successfully completed the CyberTech I curriculum and later enroll at our university will be able to receive college credit for the comparable introduction to IT course that all computer science and information systems majors must take. Students successfully completing the 75-hour CyberTech I course are also eligible to participate in the 60-hour SummerTech VB.net programming course immediately following the completion of their sophomore year.

We made all course materials available to students using the Blackboard delivery option. Assignments were divided into Units, with each Unit encompassing a chapter or similar grouping of material. Within every Unit, we integrated ethics components.

To recruit students for the program, we offered several information sessions in the evenings, where parents could learn about the program and ask questions. We learned that it was important to secure the support and excitement of at least one teacher or school counselor to ensure a large number of participants attended the information sessions. To that end, we involved counselors and principals early and often. The next sections describe the selection of the CyberTech I instructor, Site Facilitators, and teaching assistants, and provide recommendations on how to be successful during each phase of the selection process.

CyberTech I Instructor

The CyberTech I instructor selected for this program had years of experience teaching the course material with excellent student evaluations of performance. Further, the instructor had several years of experience coordinating many sections of the course at two different universities. It is critical to select an instructor who works well with students at all levels and promptly responds to student inquiries. Moreover, we recommend that others undertaking similar programs avoid the temptation to assign adjunct or new faculty to this endeavor. The instructor needs experience teaching the course, excellent organization skills, the ability to juggle conflict needs seamlessly, and superior supervision skills to monitor the performance of the teaching assistants.

Site Facilitators

Selection of Site Facilitators presented challenges significantly different from the CyberTech I instructor. While we had total control of instructor selection, we had only limited input into the selection of a Site Facilitator. The school principals assigned the Site Facilitators, often selecting volunteer teachers, who may or many not have had the necessary background. We found that giving the principal advance notice of the need for instructors helped in the assignment of a Site Facilitator with the necessary skills. Ideal Site Facilitators would have extensive experience teaching advanced IT courses, a passion to teach Advanced Placement (AP) courses, and excellent teaching skills. Moreover, the Site Facilitator needed to be organized and able to work well in online environments. Since we learned that some Site Facilitators were unfamiliar with online teaching environments, we now require that all Site Facilitators complete a special training course in the online learning management system to ensure that they can provide basic assistance to students when needed. Previous studies have noted the importance of allocating sufficient training time to teachers (Donlevy, 2003).

We found that principals were more likely to assign excellent Site Facilitators when: 1) they received ample advance notice, 2) they understood the goals of the program, and 3) we stressed the effect of teacher involvement on student success in the CyberTech I classroom. This program targets underrepresented groups, including minorities, women, disabled, and first-generation college students. Since these students may not perform well on state-mandated tests, standards upon which the principal is graded, we use anticipated improved student performance as another selling point. If we can convince the principal that the program is going to help these students perform better in the classroom, we are more likely to receive assistance in the selection of an excellent Site Facilitator.

Teaching Assistants

Teaching assistants (TAs) were critical to the program's success, since they were the first line of contact for the students. We have a Master of Science in Information Systems program at our institution, so we had a ready group of qualified graduate students who could serve the high school students well. The NSF grant allowed us the opportunity to reward well-qualified students with tuition remission and a small stipend. Like the instructor and the Site Facilitators, it is critical to select teaching assistants who are organized, fast to respond to student questions, and able to work well in an online environment. Since the TAs are often the first line of contact for the students, their ability to handle problems in a tactful manner is of paramount importance. Moreover, their communication skills, both written and verbal, must be superlative. They need to work well with the CyberTech I instructor and the Site Facilitators.

However, we knew early in the program that TAs should not be the first line of contact for parents. Unlike the college environment, high school teachers often have to deal with parents who may not have complete information. When the parents contacted the TAs directly, the TAs were always told to forward that information to the CyberTech I Instructor. In addition, although the TAs graded all student work submitted, the CyberTech I Instructor, in consultation with the Site Facilitators, assigned final grades.

Lessons Learned

The high schools operate on a calendar that is slightly different from the one used by our university. Therefore, TA coverage for grading during Spring Breaks and after the end of the semester was somewhat limited. We found that hiring one "super TA" who worked through the semester and other breaks, was very helpful to the CyberTech I Instructor.

The withdrawal process for high school students is different than the process normally encountered in universities. High school students are not allowed to withdraw from classes that meet during the day. However, for additional classes beyond the school day, they can withdraw almost until the end of the school year. It is very important to establish clear guidelines for withdrawal that do not conflict with individual high school guidelines.

The rules for changing grades also differ in the high schools and universities. High school students can appeal grades more than a year after the class was completed. In some cases, they can request withdrawal from a class well after the class has been completed. High school teachers – and sometimes counselors – have much more flexibility in changing grades than do professors in most university settings. Establishing clear guidelines for grade appeals is also necessary before starting any curriculum endeavor in the high schools.

Before, during, and after course completion, we asked for input from teachers, students, and parents in an effort to continuously improve the program. These assessment activities are described in the next section.

Assessment

Formative evaluation of each student's progress was conducted through daily quizzes and weekly assessment of work products by the CyberTech I instructor and teaching assistants (TAs). In addition to feedback from instructors and TAs, students received assistance from an online Site Facilitator at their local high school. Moreover, students were required to complete an initial evaluation before enrolling to determine their suitability for taking an online course. We used a test from one of the county systems that was given to all high school students who were considering enrollment in online learning. If the answers indicated that the student might not perform well in an online course, the student was given online advice and encouraged to visit the school counselor and/or talk with the instructor for further information.

We completed several assessment measures to determine performance in CyberTech I. First, we measured the number of students who enrolled in CyberTech I and the number of students who successfully completed the course. Second, we asked all students to take a pre-assessment test. This test was a 45-item multiple-choice test matched to the stated goals and objectives of the course. We compared the student's pre-assessment score to the score on a similarly-matched 45-item multiple-choice final exam to determine if learning occurred throughout the semester. Our results showed statistically significant differences between the pre-test and the final exam, which we used as an indication that learning had occurred.

We also conducted attitudinal surveys to gauge student satisfaction with the course. Our initial results indicated that students were generally satisfied with the CyberTech I course. However, we learned that high school students need a significant amount of interaction and activities to accomplish their activities – more so than their university student counterparts. Therefore, we plan to include more online activities in future endeavors. Moreover, we plan to better prepare students for the online learning environment so that they know what to expect from the course.

Conclusion

Our study did face a number of challenges. Since high school students are not old enough to sign a contract, they cannot agree to complete surveys. Therefore, we had to secure parent permission for student participation in assessment activities. We learned that we should give the permission forms to the parents at the Orientation Session, rather than having the students take the forms home and return them.

We also learned that students who completed the CyberTech I program as part of the school day were much more successful than their counterparts who attempted to complete the program outside of the school day. Therefore, we encourage others considering a similar endeavor to work with the school systems to plan the online course as part of the regular school day. Since schedules are planned sometimes a year in advance, early planning is essential.

Further, we believe that it is vitally important to solicit input from industry and K-12 educators. We worked closely with a group of educators from one of the largest school districts in our state. With their support, we were able to encourage other systems to join the CyberTech I program. We also engaged experts from across the nation to provide input and guidance on program objectives through their participation on a CyberTech Advisory Board. With their input, we were able to develop meaningful assessment instruments and appropriate curriculum for the high school level.

Finally, we recommend that anyone considering a similar endeavor should ensure that an appropriate team is formed. In addition to the CyberTech I instructor, we enlisted the assistance of a full-time coordinator who served as a liaison to all of the high schools. The high school principals and counselors appreciated the presence of a single point of contact they could call with questions. Ultimately, we learned that a synergistic team including university faculty, teaching assistants, Site Facilitators, principals, counselors, staff coordinators and – especially – the high school students themselves, worked together to make the university-high school partnership a success.

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