

Teaching An Internet Delivered General Education Programming Course

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Abstract

This paper details the past, present and future of a required general education programming course that is distance delivered exclusively via the Internet. The paper presents information on how the course materials are presented, graded and returned to students. It details a method of delivering Internet based content using a website and supplementing instruction with Real Video. Future considerations and tools are also presented.

Keywords: Distance education, programming course, C++

Course Demographics

CSC 150 Principles of Programming is a one of two courses at Dakota State University that meets an undergraduate general education computer-programming requirement. This requirement has been in place for the past 15 years and has seen several iterations. The course was originally developed as a main frame programming course using the PL/I programming language. It next migrated to PC platform using Pascal. It then utilized to the C language and has been at C++ for the past 12 semesters.

The on campus section the course is most frequently taken by first semester students. As with other general education type courses there are students who delay the completion of this general education requirement for several semesters. The population of the distance delivered portion of the course is for the most part either high school seniors or students who are working fulltime and interested in exploring the field of information systems.

The major focus of the course is not as much to learn the programming language whether it be PL/I or C++ as it is to learn how to program. While the course has gone through multiple iterations this focus has remained unchanged. Students learn the importance of design and testing when developing a program as well as the syntax of the language. Emphasis is placed on the concepts of sequence, selection and iteration as the basic building blocks upon which all programming can be built.

History of the Course Delivered Over the Internet

Enter the era of distance delivery with the emphasis on the Internet as a delivery medium for course work and the distance delivery mode for CSC 150 was born. The author had no previous experience in teaching distance courses. In addition he had no experience in developing web sites or web pages.

It was the philosophy of the College of Business and Information at Dakota State University that when courses were delivered via distance and the Internet they would be of the same scope and quality as they were taught on the campus. This meant that all of the assignments, quizzes and exams needed to be the same or comparable to what was being done in the multiple sections of the class being taught on campus.

Hardware Expectations for Students

Minimally students are expected to have a Pentium class machine and the Mac platform is not supported. The Pentium processor is required for being able to run at an efficient level the current video portion of the course as well as supporting the programming language which is currently Microsoft's Visual C++ version 6.

ISP Expectations for Students

Students are expected to be able to connect to the Internet using a minimum of a 56K modem that should have the capability of delivering 44,000 or higher KB's. Again it is the video portion of the class that creates the need for this connection speed.

Pre-requisite Computer Knowledge

The course has no pre-requisites in programming, distance education or independent learning. The professor is sensitive towards not allowing students from on campus to enroll in the course. Past history has shown that students who have enrolled in the course and are a traditional on campus student do not perform at even an average level. The author postulates that this is brought about by the fact the student may well be enrolling in the Internet section because they are not as motivated as the off campus learner and may actually choose the Internet based course to avoid having to go to class.

Historically the highest performers in the course have been non-traditional students who are enrolling in the course with intent of expanding their knowledge of computers and programming. For many of these types of student's it almost becomes an entry level aptitude test of their abilities to be successful in the world of computer programming. The second most successful group of students has been the group of students who are still in high school and wish to expand their horizons beyond the computer curriculum that their schools have. The university has a program called the "Fast Track Program" that assists these students with the cost of enrolling in these courses.

Course Components

The major delivery mechanism of the course includes a course website as well as a required textbook with a Microsoft Visual C++ compiler bundled. The website address is www.course.dsu.edu/csc150de. From this website students gain access to the other components of the course including chapter outlines, links to RealVideos of the course's lectures, quizzes, posting of assignments, posting of grades and frequently asked questions.

The lecture notes are actually PowerPoint outlines for the lectures. The RealVideo versions of the lectures are available from the website. These lectures were video taped in a studio using an actual class. In addition, all of the assignments for the course are posted on the website. Quizzes are accessed from the website. The quizzes are interactive in that the students answer the quiz and submit their answers to website. The web server runs Microsoft SQL as well as supporting Active Server Pages (ASP). It is the ASP that allows for immediate feedback of results and the posting of results to the course grades database. Various announcements are also placed on the website. During a normal semester the website will get approximately 3,000 plus hits from an average class size of 25.

How Students are Evaluated

Students are evaluated for the distance delivered course using the same methods and criteria as the on campus sections. There are a total of four exams that are worth 15% for a total of 60% of a student's final grade. There are eight lab exercises that the students complete and the total of the eight is equal to 20% of the final grade. There are seven quizzes that account for 20% of the final grade.

The exams are administered using a proctor whom the student obtains. Currently we are offering either a U. S. mail option or an electronic mail option. As of yet we have not yet had any students or proctors selecting the electronic option.

The quizzes are administered on line and are not proctored. The actual quiz is placed on a web form that utilizes an Active Server Page for collection of the student's response. By using the Active Server Pages and a Microsoft SQL server once a student submits their quiz the student answers are compared with the correct answer and the student is provided with immediate feedback of the results on the quiz. If there is a weakness in the evaluative process, this may be the place where it could be found as students could use textbooks, notes and other materials to do better on the quiz. Other concerns are addressed in the challenges portion of this paper.

Lab assignments are posted to the web site. This is the same way that assignments are presented to students on campus. Once a student completes an assignment which usually includes a source code file as well as a design documentation files, they submit them as attachments to a special electronic mail box that has been established for receiving course assignments and correspondence. Once the assignments have been received they are stored in a folder on the hard drive of the professor's computer where they are evaluated by compiling and running the student's program code. Each of the labs has a grading sheet that is used. Results then are sent back to the student giving them feedback on their assignment.

RealVideo Lectures

The use of the RealVideo in the course has become a working model of the integration of video from the world wide web into several other distance delivered classes on the DSU campus. It has motivated other faculty to include video within their distance delivered courses. It has also impacted on campus instruction and does provide an opportunity for classes schedule exclusively on campus to be able to access lectures when either the student is gone or the professor is scheduled to be out of town.

University Support of Distance Delivered Courses

Dakota State University provides limited support and incentives for teaching distance delivered courses.

When teaching a distance course there currently is no reduction in workload or consideration for the added work involved with teaching distanced delivered course. The normal workload policy of 12 semester hours at the undergraduate level continues to be applied. There also is no enrollment ceiling placed on distance courses.

The university does provide an undergraduate distance assistant who can be used at the discretion of the professor. The distance assistant is given an allocation of ten hours per week. Depending on the talents of the student assigned responsibilities can include correcting assignments, responding to students on the grading of an assignment or exam, and website maintenance.

Annually the university does award competitive summer grants for distance delivered course development. These awards generally run from \$1,000.00 to \$2,000.00 per course. This is competitive and internal to university and not all requests are funded annually. The money is distributed with one half payable at the end of July and the other one half is payable at the end of September. Grant recipients are responsible for giving a presentation over the Internet of their preliminary development of materials and then one additional report is required upon the completion of the course. The reporting requirements are enforced prior to the awarding of future grants.

Future Directions and Trends

On the Dakota State University campus there seems to be administrative interest in continuing to explore and expand distribution of additional course work delivered via the Internet. A review of Universities on the web certainly supports this theory on a nation wide as well world wide level.

The author anticipates that other Internet features such as Microsoft's Net Meeting will greatly enhance distance delivery. Net Meeting may well allow a professor to hold virtual on line office hours. During those office hours applications could be shared and the student and the professor would have the opportunity of communicating verbally, visually, chatting and sharing applications.

Challenges

The course continues to be filled with challenges many of which occur on a regular basis/ Listed below is a brief discussion of what the author feels are the most prevalent challenges facing distance delivery on the Dakota State University campus. In many cases there is not a single answer to eliminate or even minimize these challenges.

- 1) On campus students enrolled in the distance section. The enrollment of on campus students within the distance sections continues to be a

problem primarily because the data shows that these students do not perform at a high level. In most cases it appears that they have the ability, but are missing the motivation to do well. Another factor when working with the on campus student is they do not have a tendency to work as independently as the true distance education student does.

- 2) Administration of examinations to distance students The proctor method of administering exams as explained in more detail in other portion of this paper is certainly a solution to a difficult problem, but still has several problems. Some of the problems include the time lag from the time that the exam is mailed out utilizing the U. S. postal service until the time that the exam is received in the office of the professor. This impacts the greatly the opportunity for student feedback on material not understood. Results on exams are immediately posted to the website, however that does not provide for the information about specific content areas where material was not understood.

On line testing with immediate feedback could remedy the feedback problem, however that causes problems where students from a single location are taking the same course but testing at varying times. This continues to be perplexing to both the students and the professor. The on line testing option has been slow to be endorsed by proctors.

- 3) Grade posting The posting of grades was a significant challenge that has been resolved by using an Access database to record student grades. Students receive a login ID and password at the start of the course and then are able to have immediate access to their academic progress within the course. Information about their individual performances along with course composite information is provided.
- 4) Quizzes Quizzes are a smaller portion of the grading percentage of the course, therefore students are able to quiz on line with results being immediately made available to them not only on results but also on content which they are missing. This seems to be well received, but there are cases where the professor has become suspicious of collaborative efforts being made
- 5) Lab grading Labs are submitted electronically as source files along with the student's design documentation. This works very well as then the lab is downloaded onto the professor's machine and the exercise is evaluated. Feedback is then provided electronically. The largest problem continues to be with students submission of program yet with syntax or logic errors and feeling

that they should be evaluated based upon what they have completed.

Conclusion

Distance delivered courses are an expected part of the delivery process of courses at Dakota State University. The university provides minimal support of these courses. The major reason for undertaking this method of delivery by faculty has historically been to obtain experience and recognition for the development and delivery of Internet based distance education courses.

Future plans at the university appear to be unclear. Currently the university has been approved for two Master's programs in the computing area with both of the program building on the concepts and techniques that have been developed at the undergraduate level. At the Dakota State University there continues to be discussions by the administration of possibly taking additional courses and even major's and minors in the computing field to a distance delivered mode. However at this writing those only continue to remain discussions.