AC 2009-691: A NEW BREED OF INTERACTIVE AND DISTRIBUTED CLASSROOM ENVIRONMENTS FOR FRESHMAN AND SOPHOMORE TECHNOLOGY COURSES

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A New Breed of Interactive and Distributed Classroom Environment for Freshman and Sophomore Level Technology Courses

Abstract

A Synchronous Distance Delivery (SDD) of a course provides a pseudo live classroom environment, and it is a reasonable compromise between a live classroom and an asynchronous distance education. Synchronous Distance Delivery also allows a learning environment for the course that requires laboratory activities and utilization of software tools due to real time interaction between the instructor and the students. For a multi-campus institution, an SDD course offered by an instructor allows the institution to meet the minimum course enrollment requirement, thus avoiding cancellation of required courses for a degree program. The institution can count the total course enrollment by adding enrollment at all its campuses. SDD courses are also attractive to students because they allow students to take required courses at the campus location nearest to their home or workplace. At Purdue University Calumet (PUC), with two campus locations, all the departments within the School of Technology (SOT) actively pursue SDD for all freshman and sophomore level courses, especially for the Electrical and Computer Engineering Technology (ECET) program. This paper discusses the strategies related to technology, course schedules, technical support, and the cohort-based enrollment that leads to successful offering of SDD courses and corresponding enrollment growth in the ECET program. This paper also presents assessments data and use of this data which have improved the SDD courses and student learning.

Introduction

Purdue University Calumet (PUC) is primarily a commuter campus with 9500 students. Additionally, 1400 students take classes at its Academic Learning Center which is 17 miles away from the main campus. Seventy percent of the University students work more than 30 hours a week and many of these students are enrolled for courses scheduled for evening hours.

To accommodate more of its students by delivering course work at an accelerated rate, PUC has initiated distance delivery of ECET courses by using Synchronous Distance Delivery (SDD) method.

> "The term synchronous implies that the distance learning environment is real-time: students at the host and remote sites are able to hear and see the instructor and the equivalent of the instructor's blackboard in real-time. They can ask questions and hear responses from the instructor regardless of the campus at which they are located. In contrast, the asynchronous mode of distance delivery involves video streaming or DVD-based delivery of classroom content. Students view transcripts of class sessions whenever they choose; the live interaction with the instructor and ability to have physical interaction with classmates is absent."[1]

One of the biggest disadvantages of asynchronous delivery of freshman and sophomore level technology courses is the lack of professor-student interaction in a classroom environment.

Experience shows inadequate classroom interaction directly affects students' ability to learn the material.[1] Furthermore, asynchronous distance delivery of courses does not work well at the freshman and sophomore level because of its self-driven instructional environment that usually works well for mature audience. The other reasons are: 1) delay in the professor-student interaction and 2) the lack of ability of freshman level students to articulate a question in words in turn deters many to ask questions.

This paper discusses the strategies related to technology, course schedules, technical support, and the cohort-based enrollment that lead to successful offering of SDD courses and corresponding enrollment growth in the ECET program. This paper also presents assessments data and use of this data which has improved the Synchronous Distance Delivery of courses and student learning.

Synchronous Distance Delivery of Courses

In the Fall of 2007, the School of Technology (SOT) of PUC first delivered one SDD course, ECET 296, as a pilot study (Table 1). Consequently, the pilot test was assessed and evaluated to understand the students' learning and issues related to technology, faculty, and students.[2] The University has addressed the issues identified during the pilot study (and in subsequent semesters) to continuously improve the delivery of SDD courses during Fall 2008 and Spring 2009 (Table 1).

Table 1. Synchronous Distance Delivery (SDD) of ECET courses

Course	Fall 2007		Fall 2008		Spring 2009	
	Live	Remote	Live	Remote	Live	Remote
ECET 109 Digital Fundamentals			19	5	3	1
ECET 159 Digital Applications					14	16
ECET 210 Structured C++ Prog. for Electro-Mech Sys					16	12
ECET 296 Electronic System fabrication	18	3				

Issues encountered and solutions

Major issues identified in the pilot study for effective SDD of courses were, implementation of proper technology and technical support (includes support in content area) to enhance faculty instruction and student learning. Most students at the remote location had problems with receiving feedback on their assignments which was time consuming and often impossible. Furthermore, students' concern was the lack of trained individuals to provide hands-on help with technology and also with the laboratory assignments.[2] The helping hand (usually a graduate student) should be familiar with the course materials and laboratory materials. One solution is to employ properly trained graduate students and assign them at both locations (live classroom and remote location) to help students with hands-on help for laboratory and class assignments. This would alleviate frustration by both students and faculty. One aspect of SDD courses is that the

students have to deal with the new delivery process in addition to the rigor of the courses. Students taking SDD courses at the remote location should experience a similar classroom environment as in the live classroom. To facilitate such experience associated with students' learning, a Tablet PC, a Document Camera, and a DVD recorder/player were integrated into the SDD technology in Spring 2009.

Chalkboard writing is usually a necessary to explain figures, pictures, and large diagrams. By using a Tablet PC, the faculty does not need to travel between the chalkboard and the computer. The Tablet PC replaces the chalkboard for instruction. Also, this eliminates the reorientation of the camera which needed to be adjusted (every time faculty travels between the chalkboard and the computer stand) by the faculty member in the live classroom and by the technician at the remote location. A Document Camera allows the faculty member to demonstrate laboratory equipment, components, tools etc. In addition, it allows showing instructional materials from the text book and the laboratory manuals. A DVD recorder/player records the lecture while is it being delivered. Such recordings help students to review the lecture and also compensate for missing class time. DVD recorded lectures are then placed on the web (or on-line) for streaming. The technology setup used during Fall 2007 and the improved version adopted in Spring 2009 are shown in the Figures 1a and 1b. It should be noted that the new setup includes DVD recorders, document cameras, and two sets of Polycom cameras in the live classroom and also at the remote location. Having identical setup at both locations would allow the faculty member to alternate the delivery of the course from both locations. Thus students participating at each location will benefit from interaction with the faculty member.

Addressing faculty concerns

Two faculty members, who taught the courses for the first time during Fall 2008 and Spring 2009 respectively, were apprehensive of the new delivery method. Both faculty members also had concerns regarding the quality of the visual presentation at the remote locations and the needed help in both, course content area and instructional technology. Therefore, the author who first initiated, implemented, delivered, and assessed the first SDD course, had demonstrated the SDD to both faculty members. This provided experiential learning by the faculty members. SOT also provided graduate teaching assistants at both locations to help the faculty members with the SDD pertaining to laboratory work and assignments. The teaching assistants helped with the course delivery in content area and related laboratories including the collection of hard copies of the assignments. The graduate assistants also helped with communication between the faculty members and the students.

To improve the quality of visual presentation at the remote locations, two Polycom cameras were installed at the remote location (Figure 1b). The Document Camera and the Tablet PC were used to show or demonstrate supplemental instructional and laboratory materials. One faculty member extensively used the text book. The document camera facilitated use of the text book materials for instruction. The faculty members saved the instructional materials for future asynchronous streaming delivery. Also, each lecture and demonstration in the live classroom was recorded on the DVD recorder and later placed on the faculty course website. This allowed students to review the lecture if needed.

Cohort-based enrollment (with SDD Courses)

In an effort to increase ECET enrollment and also to avoid class cancellation due to low enrollment at the main campus, a semester plan (with one SDD course) was developed for the remote location during the Fall 2008 semester. Ninty-three students were enrolled in six ECET courses. The first cohort of students wanted a second semester plan of course offerings at the remote location. Accordingly, SOT had developed a schedule for Spring 2009 to offer the first two semester courses to accommodate the first cohort (for their second semester) and the new cohort in the program. The schedule included a total of four courses with SDD (Table 2). Such scheduling with SDD courses has resulted in an enrollment growth of 22% in Spring 2009, 113 ECET students compared to 93 ECET students enrolled in the Fall semester 2008. Coordination with the departments offering general studies courses was critical in developing the two semester plan of study.

Table 2. Cohort-based enrollment and growth in enrollment at the remote location

SESSION	SOT Courses offered at the remote location	Method of Delivery	No. of Students Served at the remote location	Number of Students in Main campus	Total No. of Student Served
FALL 2008	ECET 100: *Introduction to ECET*	Onsite	13		
	ECET 109: *Digital Fundamentals*	SDD	5	19	
	ECET 110: *Computer System Arch*	Onsite	27		
	ECET 265:*Computer Networks*	Onsite	15		
	ECET 296:*Electronic System fab*	SDD	2	12	
Total			62	31	93
SPRING 2009	ECET 100: *Introduction to ECET*	SDD	1	11	
	ECET 102: *Electrical Circuits I*	Onsite	8		
	ECET 109: *Digital Fundamentals*	SDD	3	1	
	ECET 110: *Computer System Arch*	Onsite	13		
	ECET 159: *Digital Applications*	SDD	14	16	
	ECET 210: Structured C++ Prog. for Electro-Mech Sys	SDD	12	16	
	ECET 265: *Computer Networks*	Onsite	11		
	ECET 367: *Internetworking & TCP/IP*	Onsite	7		
Total			69	44	113

Assessment of the Learning Environment

Assessment of the learning environment from SDD courses offered in Spring 2009 is reported here. There were 24 students enrolled in the course, of which 19 attended the live classroom session and the other 5 attended the class at the remote location at the same time. However, students were allowed to attend the course at either location during the semester. Out of 24 students, 9 students completed an assessment questionnaire. Of the nine students, 5 students had prior experience in SDD, two had taken asynchronous video conference courses, and two

students did not have any experience with distance education courses. On a scale of 1 to 10, five students had indicated that the SDD course provided the best learning environment (scaled 8 and above) compared to other forms of distance education delivery, one student scaled 5, and three students did not respond to the question.

Seven students have indicated that they had signed up for an SDD course because the remote location was close to their residences. Seven students agreed that the 24/7 availability of software resources from distance location were useful, one student did not find this availability to be useful and one student did not respond. In response to the question, "… anything that could be done to make the environment more conducive to learning of the course materials", students have indicated that the uninterrupted functioning of the technology was important, otherwise valuable learning time would be wasted as the technology is being fixed during the instruction. The subjective and formative assessment of students' learning from the *pilot study* was reported by the author under three categories: pedagogy, learning environment, and students' engagement. [2]

Summary

Purdue University Calumet introduced Synchronous Distance Delivery (SDD) of Electrical and Computer Engineering Technology (ECET) courses to students at its satellite (remote) campus 17 miles away from the main campus. Assessment from a pilot offering of an SDD course in Fall 2007 highlighted the issues related to such delivery. Each of these issues was addressed for SDD courses offered during Fall 2008 and Spring 2009. The issues were related to appropriate distance education technology for laboratory based courses, availability of technical help in content area, both in the live classroom and at the remote location. Integration of multiple technology and help through graduate teaching assistants improved the learning environment and also addressed the concerns by faculty regarding the quality of SDD.

A one-semester course schedule was offered during Fall 2008 at the satellite campus to provide cohort-based instruction. This was followed by a two-semester course schedule offered in Spring 2009. Such scheduling had accommodated two cohorts of students and enrollment growth was twenty-two percent more in Spring 2009 compared to Fall 2008 for ECET courses.

References

[1] Matthews, C., Synchronous Distance Delivery of an Electrical and Computer Engineering Program, 35th ASEE/IEEE Frontier in Education Conference, 2005

[2] Hossain, A and Latif, N., Synchronous Delivery of Engineering Technology Courses to a Remote Location – issues and challenges related to Technology and students' learning, Proceedings of the Annual Conference of the American Society for Engineering Education, 2008

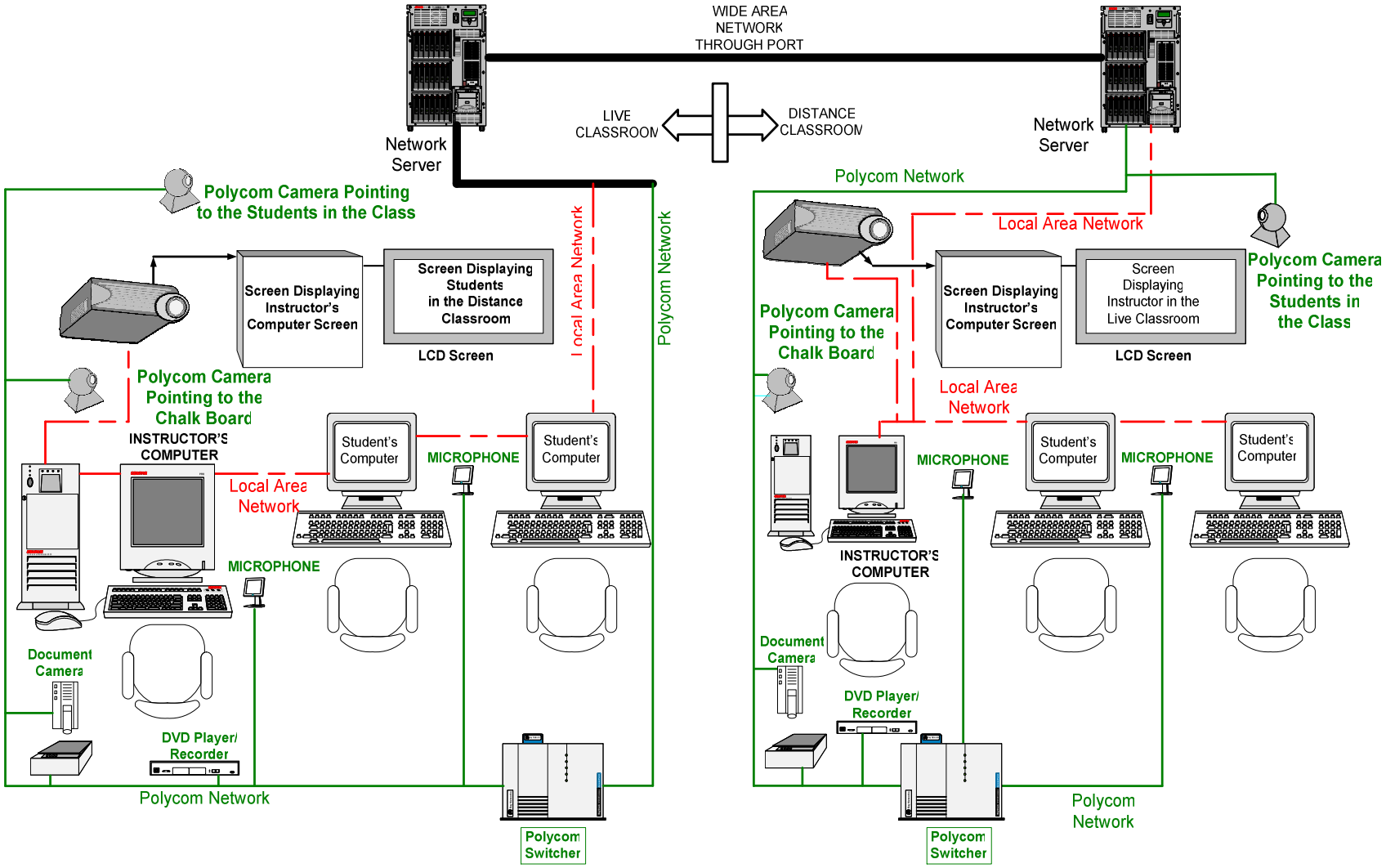

Figure 1b: The ***modified*** SDD Setup for the Live and the remote classroom during Fall 2008, and Spring 2009 (note, DVD recorder, document camera and two cameras in each classroom

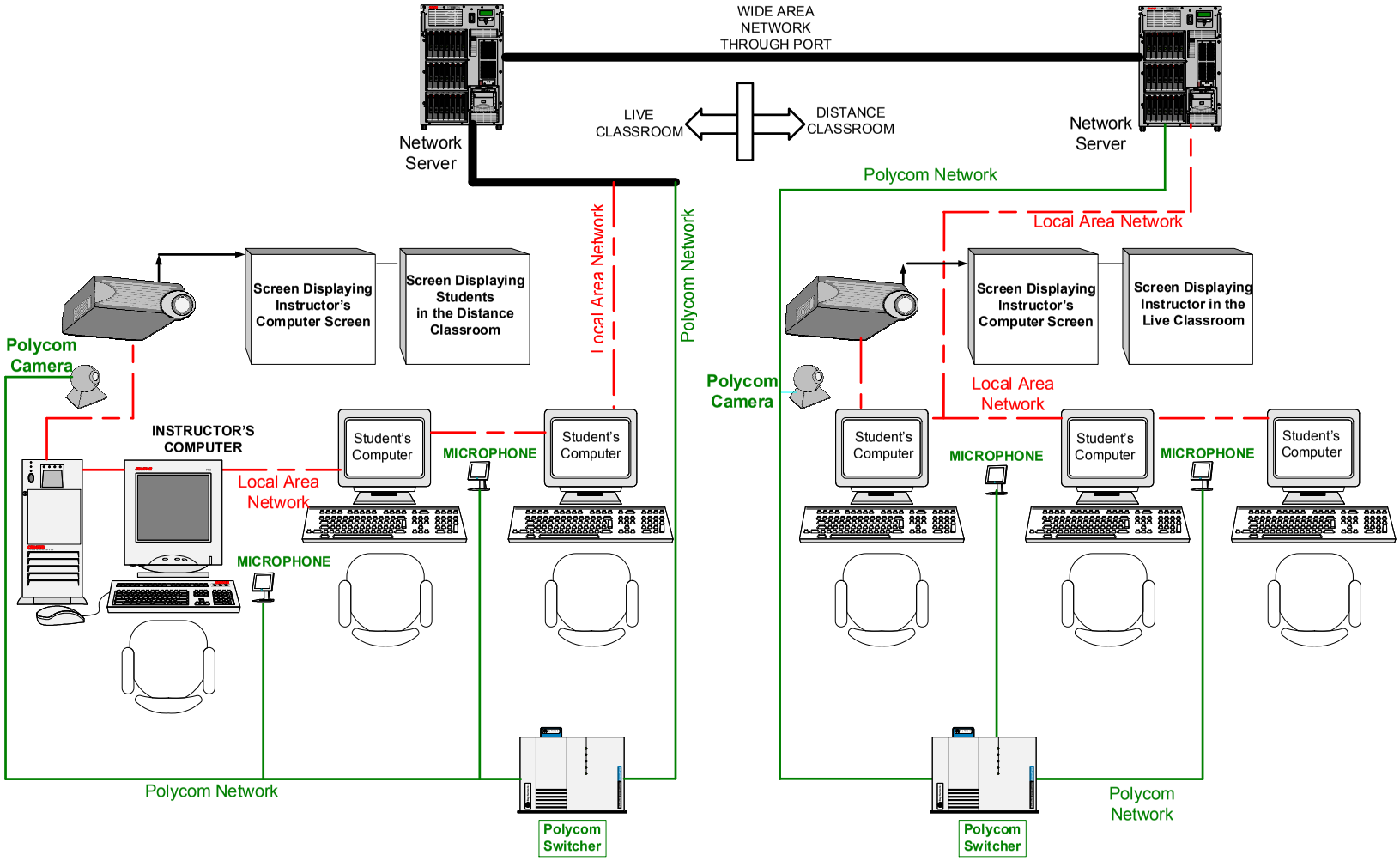

Figure 1a: SDD Setup for the Live and the remote classroom during Fall 2007