Distance Learning (Via Internet) for Cooperative Education Students During Coop Work Periods
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Abstract

Cooperative Education is a strategy that promotes student learning in ways that enhance and complement traditional course work and laboratories. This results in students who are fully prepared to enter their profession upon graduation. Typically, students work full time on coop assignments for a fixed time period with no ongoing, formally structured feedback/learning mechanisms during work periods. Reflection often occurs after the work assignment is completed. Coop distance learning during the work period provides an opportunity for enhancing students' cognitive, affective, and behavioral development through continuous reflective dialogue and through facilitation of dialogue that connects the students' experiences to their academic curriculum. In addition, distance learning links students to the University during their coop, and is likely to result in higher retention.

Rationale

We presented a paper [1] in April, 1996, at the American Society for Engineering Education New England Section Conference that sets forth a rationale of how coop can fit into the larger University educational structure (this paper has been submitted to the ASEE Journal of Engineering Education). When this rationale is fully carried out, the expected outcome is that students will integrate coop work experience with the academic component in a manner that is consistent with the Accreditation Board for Engineering and Technology (ABET) ENGINEERING CRITERIA 2000 [2] philosophy and objectives. The guiding principles in designing the curriculum for this project, in addition to the proposed ABET criteria, were the Northeastern University Cooperative Education Curriculum [3] and the Philosophy and Goals of the University-wide Academic Common Experience (ACE) Initiative [4].

We have incorporated all six dimensions of the Educational Goals of the Cooperative Education Curriculum: critical thinking, knowledge, communication, social responsibility, personal and professional growth, and career preparation. For the ACE goals, we addressed the interconnectedness of learning: all of the skill elements; both the natural and social cultural world contexts; the ethical and personal perspectives; and connections between the theoretical and the applied, between college and the world of work, and between college study and lifelong learning. Faculty from both the Cooperative Education and Electrical and Computer Engineering Departments developed these modules.

Project Description

The Project

The project is a pilot program for all of the electrical and computer engineering freshmen/sophomores whose first coop work experience begins in either the Summer 1996, the Fall 1996, or the Winter 1997. These eighty students will have worked at more than fifty coop companies spread throughout a wide geographical area. Utilizing the Internet as a vehicle, students access newly designed structured learning assignments throughout their work period. Students access these assignments on the ECE Coop Web Page [5].
and respond asynchronously via email or back through the Web Page to their coop instructors. Additionally, through computer conferencing, they interact with their classmates on common issues. Students thus have access to a virtual Reflection Seminar throughout the work period.

**Project Implementation Steps**

The following steps form the tasks for carrying out this project.
- Complete Literature Review
- Provide Theoretical Basis and Underlying Concepts
- Design Curriculum Modules
- Develop Information Collection Strategies
- Conduct Meetings with Employers
- Design Feedback Mechanisms for Student Interaction
- Develop Evaluation Tools
- Write Report
- Disseminate Results

**The Three Project Phases**

Northeastern University’s College of Engineering undergraduate curriculum is primarily a five year program (eleven academic quarters and seven coop quarters) leading toward a Bachelor of Science degree with specification in one of four academic departments. Students start their first coop period after their freshman year in either the Summer, Fall, or Winter quarters. As the Cooperative Education Coordinators for the Electrical and Computer Engineering Program and as the Principal Investigators for this pilot project, we selected for participation, all eighty ECE freshmen and transfer students whose first coop period coincides with these three quarters in this current academic year. Thirty students started coop in the Summer 1996, fifteen students started coop in the Fall 1996, and thirty five students are expected to start in the Winter 1997.

**Phase 1 (Summer/Fall Quarter)** students are on coop for a six month period. For each of their six months on coop, they are assigned to complete a specific learning module.

**Phase 2 (Fall Quarter)** students are on coop for a three month period. For each of their three months on coop, they are assigned to complete a specific learning module. These three modules were finalized after analysis of Phase 1 student responses.

**Phase 3 (Winter Quarter)** students are on coop for a three month period. For each of their three months on coop, they are assigned to complete a specific learning module. We will analyze the Phase 1 and Phase 2 student responses and employer comments to finalize the Phase 3 learning module assignments.

**Computer Communication Technology Survey**

As a precursor to this project, during the Spring 1996, we asked students who were returning from a coop work period to complete a survey [6] that inventoried their access and use of computer communication technology on their coop job as well as at school and home. Fifty five of the eighty students who were on coop during the Winter 1996 completed and returned the survey as part of our regular Reflection Seminars. The results [7] show that virtually all of our students presently have ready access to the Internet and a majority use computer communications as a regular part of their day to day activities. Students reported that their employers’ use of computer communication technology was increasing at a rapid rate with projections to double or triple their usage in a short time frame. The survey gave us assurance that students would have access to our Web Page and to our conferencing system from their work site or their home.

**The ECE Coop Internet Site**

The computer home base for our project is the Northeastern University, Electrical and Computer Engineering Department, Digital AlphaServer™ computer. The ECE Coop Internet Site is located here and it serves as a communication, information, and learning center for students, employers, and other interested parties.

The Coop Long Distance Learning pilot project has been dubbed as “Project ECE COOP 2000” (the freshmen participating are scheduled to graduate in June, 2000). Students log on at this page, a subset of the ECE Coop Internet Site, to access their project assignments. From this page, they can link to the conferencing system (this system is password protected to encourage open comments and dialog among students).

**Coop Employer Participation**

Employers function not only as suppliers of coop work but as educational partners as well. To bring the employers on board to the concept of students performing asynchronous coop reflection assignments during their coop period, we set about arranging a series of small group breakfast meetings with coop supervisors, managers, and HRM personnel to describe the project and to elicit their support. We intend to incorporate their suggestions into Phase 3 for the Winter 1997.
Project Goals

We set the following four major goals for this pilot project:

1. To develop technology based curriculum modules that incorporate elements from a University wide curriculum initiative (ACE) (These modules are Internet based exercises for students to complete throughout their coop period)

2. To investigate the current state of technology infrastructure and the accessibility of required equipment to students on coop, as well as to demonstrate the feasibility, strengths and limitations of long distance learning through the Internet, (Projections can be made of infrastructure demand and capability if there were to be widespread acceptance of this long distance learning strategy throughout a University-wide system)

3. To better integrate students’ co-op experience with their academic course-work (Additionally, communication links between students and faculty are available as a result of this project), and

4. To increase opportunities for collaboration and integration between coop and academic departments (An ECE faculty member is a participant in this project. Links are included so that students on coop who are taking classes at NU in the evening can communicate to their instructors. Also faculty from the ECE department will have direct access to student reflection exercises and responses)

Evaluation tools to measure the impact of this pilot have been developed and used [8]. From this evaluation, new goals can be set and further work can be planned .

Strategies to Carry Out the Project Goals

The following ACE based goals (along with the Cooperative Education Goals and ABET Criteria 2000 objectives) form the basis for the development of the specific curriculum modules and the subsequent Internet based monthly assignments [9].

Skills
Goal: Effective Thinking
Strategy: Students reflect on application of course-work to job

Goal: Effective Communication
Strategy: Students write coherently about their work environment

Goal: Information Literacy
Strategy: Students communicate via Internet to build computer literacy skills

Goal: Interpersonal Skills
Strategy: Students relate to work team interactions

Contexts
Goal: The Natural World
Strategy: Students observe how scientific principles result in real world application

Goal: The Social Cultural World
Strategy: Students reflect on their interaction in a culturally diverse workplace

Perspectives
Goal: The Ethical Perspective
Strategy: Students discuss ethical dilemmas which occur in their workplace

Goal: The Personal Perspective
Strategy: Students inventory their personal and professional growth during co-op

Connections
Goal: Between the Theoretical and the Applied
Strategy: Students observe the relevance of academic course-work to the workplace

Goal: Between College and the World of Work
Strategy: Students report on differences of role of student and role of employee

Goal: Between College Study and Lifelong Learning
Strategy: Students observe varying professional role models in the workplace and the impact of remaining current in their field

Results

This paper was submitted to meet the deadline (June 1996) for publication in the Proceedings of the Frontiers in Education (FIE) Conference which occurred at the start of this project implementation. The results that we present at the FIE Conference (November 1996) can be accessed through the ECE Coop World Wide Web Site. The URL for the Coop Long Distance Learning Project Report is http://www.ece.neu.edu/coop/2000rep.html [10].

The Reference List at the end of this paper lists specific Web page locations for materials referenced in this paper. Supporting documentation and continuing updates will be posted as they become available (the Project ECE COOP 2000 pages are appropriately linked).

Implications for Future Work

Curriculum modules have been specifically written to address ACE and Cooperative Education goals as well as the proposed ABET CRITERIA 2000. After analyzing the students’ responses and employers’ feedback, these modules will be fine tuned for the engineering program. Other curriculum modules can be developed for other co-op disciplines that cut across all
colleges and all majors and may be applicable at other Universities.

The pilot covers students’ first coop assignments, and is a follow up to material covered in a basic freshman introduction to engineering course. Additional modules that might be designed for later coop periods would allow learning to occur in a cumulative manner. Initial planning has begun to introduce cooperative education courses into the engineering curriculum that would complement and reinforce these long distance learning exercises. We expect the success of this program will have a ripple effect on other programs in coop and their respective academic departments.

Utilization of the Internet continues to explode. We assume that new technology to achieve greater bandwidth capabilities will be cost effective to keep up with the increasing demands. Students need to master and utilize computer communications technology effectively as an everyday tool. This project has demonstrated the value of these distance learning exercises as one such way of ensuring student mastery and utilization.

We expect that the success of this demonstration will strengthen the concept of cooperative education learning as an integral part of an engineering student’s education. This will allow engineering programs an effective way of helping achieve compliance with the proposed ABET CRITERIA 2000. Students will be expected to make better connections between the workplace and the academy.

Several opportunities to connect students, coop coordinators, academic faculty, and employers in new ways have emerged throughout this project. These links can be strengthened as we build new curriculum.

This pilot is serving as a foundation for a $500K external funding proposal that would integrate academics with real world experiences in the Colleges of Engineering and Business at NU. The value of coop learning as an integral part of a University education is increasingly being recognized.

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