College Quarterly
Spring 2004 - Volume 7 Number 2

Home
Contents

The Fleming Applied Projects Program

by Peter Spasov, P.Eng., M.Ap.Sci.

Abstract

Applied Projects is a program where every technology student engages in an intensive team project full time during the final academic semester. A wide range of enterprises provide the real-world problems that form the basis of student projects. This article describes the program and how Fleming College uses this program for applied research. To date, student teams set up systems and provided technical support for internal college and external researchers. This includes technology to assist the elderly, development of indoor locating systems, and laboratory and information systems for DNA research, software development for man-machine interface research, and others.

Introduction

September is harvest time. The OPP Drug Enforcement Unit is out on the prowl looking for crops. Grow houses typically use high-powered sodium lamps. Can the search for grow houses be improved by analyzing radio emissions or power consumption profiles? Trent University's DNA Laboratory conducts DNA Analysis for things such as tracking wolf migrations. DNA analysis involves many repetitive laboratory operations. Can the biologists figure out how to set up and run the robotics work cell? Do they have time to develop a mobile computing application to collect field data? CITO (Communications and Information Technology Ontario) funds a partnership between the college and a mobile telemedicine firm to develop a prototype indoor positioning system. Can students be involved in this endeavor? Materials and Manufacturing Ontario (MMO) is funding student/industry partnerships. For example, a heating duct manufacturer needs to more efficiently produce elbows for forced-air conduits. How can management know enough to make an upgrade decision?

The applied projects program is fundamentally about student learning. However, its application to applied research is an additional bonus. This is one model for college involvement in applied research. This article describes how this program accomplishes these goals. Initially, we outline how the program works. Then we examine how Fleming College uses the program for applied research.

About Applied Projects

An enterprise such as a private sector company or non-profit

organization has something on the back burner. There is a process or product dilemma that is useful to check out or solve but the enterprise does not have the time or financial resources to solve the problem. These problems also provide learning opportunities for students who need to learn competencies in their particular vocational area. In our case, we have 3-year diploma students intending to pursue careers in computer programmer analyst, computer engineering technology, networking technology, and automation/robotics technology. Future projects will also involve computer security and investigations and fire systems engineering technology. The first paragraph illustrated a few of the problems Fleming students have solved.

Under the Applied Projects initiative, in the final academic term every technology student engages in an intensive team project. A wide range of sponsoring companies and organizations provide the real-world problems that form the basis of student projects. Companies and organizations can get around to doing things they otherwise would not get around to doing. Students gain education benefits. The project work enhances each student's problem-solving skills, applied industry knowledge and ability to be a valued member on a technology team.

First, it is important to note that the entire technology curriculum at Fleming includes team work, development of career portfolio, communications, and project management. With the inclusion of specific technical curriculum, this form the basis of student preparation for applied projects.

During the summer we establish potential projects using a Request for Proposal (RFP) process. The fall is for project planning and the winter is when students execute the projects. These projects may take place at the college or at the sponsor's site. In some cases, the sponsor's site is out of town. Hence, students would knowingly choose these types of projects realizing that they would have to live out of town during the winter semester. For projects at the college, students work either in dedicated staging lab or a dedicated space in our engineering commons. A typical staging lab scenario is a desk with some computers to develop a software application. A typical engineering commons scenario is space to set up and test equipment and machinery.

In the fall semester, all technology students in their final year (5th semester) take a mandatory general education course, Working with Business and Industry. At the beginning of the course, we post the list of potential projects. Students apply to work on projects of interest. Faculty mentors select the student teams for each project. Each team then plans their project under guidance by the mentor. The course also includes instruction in fundamental aspects of business operations and health and safety regulations. The student teams apply this knowledge to their specific project and sponsor. Each student team develops their project plan in collaboration with the

sponsor.

During the winter, each team executes their project, full time, with no other timetabled courses. The program differs from cooperative education or field placement in several ways. The relationship between students and sponsor is more like that between a consultant and client. A cooperative or similar program usually involves an employee-employer type relationship. There is a framework where teams need to follow appropriate project management practices. For example, each team must conduct formal technical reviews with their sponsor. Each team has a faculty mentor who evaluates and provides guidance. Students may also consult other faculty and each other for specific technical issues. For example, a typical software application involves design and verification of a database design. The students can have other faculty and other students review their design. Each student writes a final project report to the OACETT (Ontario Association of Certified Engineering Technicians and Technologists) guidelines. The climax is our Technology Showcase. This event is like a trade show where each team displays their project in a booth. Attendees are the public and businesses. Volunteer judges evaluate teams for the Bell Canada Awards in marketing, innovation, academic and project management best practices. Bell Canada also sponsors the celebration banquet for the students, project sponsors and guests.

Applied Research

The applied project semester is full time without timetabled classes. This enables students to work on projects out of town, better balance family and academic commitments, and other advantages. This full-time aspect also enables applied research. Thus, the applied project provides one mechanism that is analogous to graduate student work in a university. The ability to use applied projects for applied research was an unforeseen bonus that became apparent during some of Fleming College's applied research activities.

In a university setting, graduate students typically do work for faculty to further the faculty research goals when completing their academic thesis requirements. The faculty advisor and subcommittee of professors approve a thesis research topic for the graduate degree candidate. The candidate works on the thesis until it is deemed to be completed by the faculty committee. The graduate demonstrates completion by defending her or his thesis before the committee. There is no fixed end-of-semester specified date by which the thesis must be completed. Instead, there are guidelines setting the parameters for thesis completion.

Applied projects have some similarities to the graduate student thesis methodology. The college has received funding for applied research activities. The funded researchers can use a student team as an applied project. They do this by becoming a project sponsor. The researchers are able to get some work done that would otherwise

not get done, or would be accomplished only through more difficult means. The students learn skills related to their program of study, by solving a problem for the sponsor. In this case, the problem happens to be applied research.

Applied research differs from theoretical research in that researchers are investigating ways to use known technology, instead of discovering new pure scientific knowledge. This type of research is consistent with the goals of applied projects, which requires that the students work on solving a real-world problem in an industry type setting. This problem solving is about using known technology in innovative ways.

Applied Technologies For Healthy Aging Research (ATHAR)

Provincial legislation required that older long-term care facilities be shutdown and replaced by modern facilities. The college established an Institute of Healthy Aging and forged a partnership with the St. Joseph's Healthcare Group. The college provided the land for the new St. Joseph's at Fleming long-term care facility. This new facility will model improved ways for caring for the elderly that is more dignified and home-like instead of an institutional regimented environment. This facility will begin operations during the latter half of 2004. The college's Institute of Healthy Aging will use the facility to incorporate themes of elder care into college curriculum, in particular nursing students. Researchers in the field of elder care will be able to conduct their research at this facility.

In 2000, the Canadian Foundation for Innovation (CFI) and Ontario Innovation Trust (OIT) provided infrastructure funding for Fleming College's Applied Technologies for Healthy Aging Research (ATHAR) Laboratory. The funding covered acquisition of equipment and associated infrastructure expenses over a three-year period. This fund did not cover teaching release for faculty. The college still needed to cover or find additional funding to actually do the research. One of the research goals was to investigate use building automation in long-term care facilities to improve quality of life for residents. Another goal was to investigate uses of information technology to improve management of long-term care facilities. The third prime goal was to develop and investigate indoor positioning systems for tracking whereabouts of residents and assets such as Hoyer lifts.

There is considerable work required to specify, procure and set up the equipment and systems needed for this research. Hence ATHAR became a sponsor for some applied projects. Some projects included Quality of Service test bed for network communications protocols, remote administration system, appliance automation, and Personal Locator System (PLS) development. Thus we were able to have students assist with setting up the research infrastructure and conduct some initial investigations into technical issues concerning the systems. These projects and other student projects from earlier semesters would include involvement with the Institute of Healthy

Aging. We anticipate future applied projects involving use of technology at the new long-term healthcare facility.

Ubiquitous Location Tracking (ULT) Project

Invention of a system that can track position of residents in a cost-effective manner is a challenging technical problem. As one of five projects, in the Communications Information and Technology Ontario (CITO) College Partnerships Program we received funding to develop a prototype that would use standard (non-proprietary) radio communication systems. The prototype demonstrated tracking a prototype tag using a standard wireless networking protocol. Specifically, we used the IEEE 802.11b protocol. The CITO fund covered hiring of researchers, some equipment and some teaching release time for me. We hired two graduates as the researchers. We also established some applied projects to assist the researchers. Thus the researchers who themselves recently were students in other applied projects, became sponsors of new applied projects. One applied project was the development of an enhancement so that a tracked device can switch between a wireless network for indoor use and a cellular phone network for outdoor use. Another project was to conduct extensive tests of wireless data propagation. The third project was to test and fully document software. These latter two projects enabled the researchers to focus more on actual development. The applied project students benefited from experience with leading edge technology.

University Collaboration

When we developed the applied projects program, we anticipated that projects would be for businesses and organizations. We had not considered the needs for university research. With hindsight, these needs are now apparent. Many university researchers, including those in non-technical fields, have very sophisticated technology needs to operate in their laboratories. This section describes our experiences in this area. Naturally, much of the collaboration occurs with the local university in Peterborough, which is Trent University. However, we have also worked with Queen's University in Kingston and Carleton University in Ottawa. Recently, University of Toronto has shown some interest in our Wind Turbine project.

Trent University was establishing a reputation for excellence with DNA analysis in wildlife research. They received robotics equipment for laboratory automation. However, they needed technical support to set up the system. This became a great opportunity for robotics students. The DNA researcher sponsored an applied project. Information systems for collecting data in the field for placement into a database and then the subsequent analysis are another need. One applied project with a team of computer programming and networking students developed a component of this system. Through the vision of the Trent researcher and others, the DNA Cluster project has become

a regional endeavor worthy of its own article.

Occasionally our academic centre will sponsor projects as demonstration projects. Some of these involve other robotic laboratory procedures. Often, Trent University has become a partner in these projects by providing expertise, laboratory procedure instruction and equipment. Some equipment suppliers have also become similarly involved.

At Carleton University, one department for psychology specializes in the study and improvement of man-machine interfaces (cockpit systems) for aircraft and simulator training for pilots. An applied project team lived in Ottawa and enhanced the software systems used in the aircraft simulation system. Our collaboration with Queen's University was more about industry collaboration than research. Chemical engineering students at Queens participate in their TEAM course – Team Engineering and Management. These student teams solve a chemical engineering problem for a real client. This is a novel opportunity to have students practice the working relationship between engineers and engineering technologists. The applied project students provided practical hands-on skills to complement the analytical skills of the engineering students. In one case, the Fleming students assisted with practical needs for distillation tower simulation. In the other, the student developed the means to physically test the simulation results for a vaccine mixing process.

Sometimes projects for other sponsors inherently involve applied research. This article began with a marijuana grow house search scenario. In this project, students investigated means to remotely detect sodium lamp usage. Most applied projects involve improvements of products and services, which would be an application of known technology – although new to the students. Hence it would be a stretch to classify these applied projects as applied research.

As described earlier, students apply for projects of interest and faculty select the teams. Normally, we have more potential projects than there are students available. We had potential projects with Trent University that were, specialized computer keyboard timing application for psychological study of human reaction times, modernization and extension of analytical software for a chemical analysis laboratory, and prototyping a head mounted EEG system for sleep research. A problematic aspect of applied projects is to convince students to attempt the unknown when selecting potential projects. Students tend to apply for projects that sound familiar with previous curriculum such as creating a database for a sponsor using the same software used in their database and programming courses. We will be attempting a new coaching system next fall that will hopefully motivate students to be more adventurous and ambitious in their project selections.

Conclusions

The Applied Projects program involves student teams solving a problem for an enterprise sponsor. The enterprise sponsor is one who provides the setting for a real-world problem to form the basis of the student project. Every 3-year technology student is required to take the Applied Project semester, which is full-time with no classes and occurs during the final semester. The projects are a problem-based learning method for students. Some of these projects may involve assisting researchers, both those at the college and those at other institutions such as universities. For more information about the program, see www.flemingc.on.ca/appliedprojects. Applied Projects enabled students to assist in college applied research activities to setup, test and develop components for the Applied Technologies for Healthy Aging Research Laboratory. Finally, note that our Lindsay campus, the School of Environmental Sciences and Natural Resources, has done extensive applied research not described in this article.

Peter Spasov, P.Eng., M.Ap.Sci. is a faculty member of the Centre of Applied Computing and Engineering Sciences at Fleming College in Peterborough Ontario. For five years he has been Coordinator of Applied Projects. He is project leader for the CFI/OIT Applied Technologies for Healthy Aging Research, and the CITO Ubiquitous Location Tracking project. He is the author of "Microcontroller Technology: The 68HC11" and "Programming for Technology Students Using Visual Basic" both published by Prentice Hall. Peter enjoys hiking, cross country skiing, canoeing, and is a volunteer actor for the 4th Line Theatre in Millbrook, with his wife and three daughters. His pre-college industry experience has been Instrumentation Engineer for Gulf Canada. He can be reachet at (705) 749-5520 Ext.1217 or pspasov@flemingc.on.ca

Contents
