Program Review 5 Year Period 2010 - 2014

Earth Resource Technician Program, Co-op

An Applied Geology Program

With Information gained from:

Full and Part Time Faculty, Technologists, Employers, Current and Past Students, Corporate Academic Professionals, and Various Industry Advisors, including a Consultant to the President of Fleming College

Digital Copies of this Draft and components of it are available at:

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INTRODUCTION:

The Program Coordinator of the Earth Resource Technician Program, Co-op (ERT) , present this documentation of the evolution of the Program over the past 5 years period. It is timely to assess the significant changes that have occurred in program delivery (it became a co-op program in 2011); and the impact that has had on Faculty, students and industry. The transition to an applied geology program with a co-op component has prompted an intense and ongoing curriculum adjustments to compliment and capitalize upon the students’ work experience.

The introduction of a 6 month period, mid program, monitored and evaluated, paid work term in applied geology reversed the downward enrollment trend for this program. It also has generated a lot of employer attention and feedback. It has stimulated frequent queries from prospective local, countrywide and international students. Further, this assessment is an opportunity to examine good concepts taught and real needs that have become apparent to support today’s program. It also highlights lessons learned from the program transition to a co-op format. In particular, it has become apparent, regarding student satisfaction, that equipment and infrastructure need renewal; and that more detailed discussion is needed on an ongoing basis between staffing managers and the program faculty. A part of this review process is to project the experience of today forward in time, and ask for further support.

1.1A Applied Geology Industry Trends:

**Locally:** Industry trends are summed up in two words, infrastructure and development. The evidence of significant employment opportunity abounds, even in the Lindsay area. The extension of Highway 407 south of the campus is a major infrastructure project. It is, and will be (for the next several years) generating new work in development, and resource/ land use related employment that is ideal for Fleming students. With three years of students working in co-op jobs, largely within 150 kilometers of the campus, regional employers are cognizant of the College, the program and the potential of ERT students to meet their needs. Employers are now communicating positions for employment to the College year round. This activity should increase in the future. Site plan revision, resource extraction reporting, land, engineering and property surveying and site locate services are all demanding new staff.

**Regionally:** With respect to major infrastructure and development work Western, Eastern and Central Ontario are on the verge of implementing public transit expansions in Ottawa, Kitchener- Waterloo and Toronto. Multi- billion dollar projects are also nearing activity with the new international bridge at Windsor and with the replacement of the Champlain Bridge in Montreal. Construction in Metropolitan Toronto is buoyant.

With respect to minerals and mines there are currently about 42 major mining operations that are active or in development in the Ontario minerals sector, quite apart from the soil (aggregate) and rock mined for construction purposes. The volumes of materials being moved related to these two sources is immense. These activities involve surveying, quality control work, ground water assessments, assaying, and a suite of exploration roles for our coop students and graduates. The current news in the Ontario minerals industry relates to the industrial mineral, graphite, and the copper, iron and chromium deposits in a Northern Ontario area characterized as the “ring of fire”. There will be extensive northern infrastructure development related to mining in the near future. A complication of development in this region is the northern climate (and permafrost impacted subgrade materials). There will be a boost in training technical people for quite a variety of civil engineering, and mining development jobs in the North. A proposal was made to collaboratively utilize the resources of Northern College, Confederation College and Fleming College in an effort to accomplish needed education and training for that region.. An upward trend in human resource demand by the Northern mining sectors usually results in pressure upon the other applied geology employers as they try to locate good quality earth resource technicians..

**Nationally:** Multi-billion dollar projects are imminent in British Columbia, as the C3 hydro dam project, new shipping facilities, and materials handling facilities. The national human resource trends , as assessed by the Federal Government through Employment Canada and in a specific suite of work, the Mining Human Resource Council, denote a better than the average outlook for job seekers, as long as people are situated in the right locations. With respect to new ERT students, new career paths are arising in pipe line construction, pipeline rehabilitation, oil patch and natural gas extraction, and environmental and construction roles linked to those activities,

Broadly speaking the minerals industries alone will experience hiring to replace many of the 56000 workers who are reaching retirement age in the next decade. There is clearly a need for more workers in applied geology and therefor more impetuous to, in a measured way, attract and train skilled analytical workers.

1.1B Trends noted by the Program Advisory Committee; and

Advice from the Committee (2014 minutes of the committee are in the Appendix)

1. The engineering sector would enjoy short term technological training involving foundation construction, pavements, contract management, error reduction, and construction surveying if offered by the College
2. The Minerals sector would like the College involved in site management training for junior staff related to site layout and drilling programs, and logistics Mining lands management has expanded in scope with each Province regulating and documenting (with interactive on line resources) mineral There is also a need for minerals engineering technicians with more training in material identification and core logging,
3. The energy pipeline construction sector needs quality control personnel and safety personnel who have knowledge of soils, and soil stability. This extends, in this industry along with other pipeline infrastructure, to corrosion analysis and soil pipeline interactions.
4. The geophysical firms have mitigated some the past two years of reduced activity in mineral exploration by supplying environmental site mapping services. Geophysical work involves remotely sensing variation in the subsurface and figuring out what is causing that variation, and the volume of earth that is anomalous. The technology has advanced, however, and methods that formerly could only define large targets have become quite precise and sensitive permitting higher definition of changes in the subsurface. Education with respect to geological properties and instrument responses and software are a good fit with the College. Further XRF usage is becoming quite common and should be embraced by the program.
5. The decades long shift of quality control obligations to construction companies and materials suppliers has expanded the numbers of laboratories and need for qualified personnel to operate the same.
6. Technology training in geotechnical work is not available to the degree engineering firms would wish. And in both the geotechnical and minerals sectors support staff with business and technical skills are difficult to attract.

1.1 C Program Alignment with Applied Geology Trends

The program successfully sets up willing students to open the doors to most career paths in applied geology. It has endeavored to do this through the history of the program. The extraordinary high percentage of graduates who work in applied geology suggests that the curriculum has tracked technical and social changes in these workplaces with some success. The current co-op form of the program has resulted in hundreds of recommendations, conversations (with students, employers) and even site visits during the past four years. The flux of feedback continues to inform the College of trends and needed resources. The College hired a Professional Geologist with recent and detailed field experiences, to further support this activity. The College did not replace the geophysical expertise of Grant Bashford, upon his retirement. In this respect the College is not following the high technology trends of mineral, rock, water, spills and rock structure exploration, which have been key to many graduate jobs. The Faculty continue to strive to engage the students with tools and ideas leading to relevant and timely work in the industry.

1.1D How the Program Fits the Strategic Mandate,

Short Term Planning, and Justification for Expansion

An indicator of the fit of the Earth Resource Technician program within the School of Environmental and Natural Resource Sciences has been the commissioning of a study by the Fleming College President’s Office in 2012, to evaluate the relevance and sustainability of geology as an avenue of study at Fleming and to assess capitalizing growth. This study was commissioned using the external services of Dr.Michael Cooke, and resulted in a documented and detailed technical report, **The GeoCentre at Fleming,** *A Commitment to Excellence in the Earth Sciences,* **Business Case and Development Plan 2012-2016.**  This report strongly advocated a “GeoCentre” for the Frost Campus, building upon the ERT and Drilling Resource programs. Highlights of the report are facts coincident with College and School planning for ERT; that the program should double in size by 2015, and should see renovated facilities and Faculty renewal.

The some of the broad strokes of how the program might evolve as explained by this study follow.

Regarding a Geocentre at the Frost Campus, involving drilling and ERT:

* 100% more graduates by 2016
* Renewed curriculum
* Technologist level graduate certificate by 2015
* Renewed Facilities by 2014
* New entrance and exit pathways by
* Collaboration (a resource centre) in program or course delivery with Northern Colleges,
* An accreditation plan by 2015
* Even broader industry engagement

In the two years since this report the College has made some headway on a few of the objectives:

The ERT program intake has improved 41 % with extra-ordinarily little marketing , nearly zero infrastructure improvement , and virtually no change in the number of full time Faculty numbers at this point; but retirement of one and hiring of younger, seasoned and different expertise. (The Resources Drilling program has also grown)

1. The Co-op course was in the second iteration when the report was commissioned and was highlighted as a key component of program development and GeoCentre development.
2. The College agreed to the study of post diploma programming and the Program Advisory Committee concurred in principle, but the technical thrust of such an initiative is still in discussion.

1.1D Employment and labor Market Data

This study is comprised of three components; co-op hiring, graduate employment, and a “snap shot” of a limited number of relevant employment opportunities within a several day period in the Fall of 2014. The “snap shot” was accomplished by the Fleming Library Services Group and it was quite detailed in the exploration of some applied geology jobs being offered at that time. The complete study is in the Appendix.

The employment market snapshot, Fall 2014:

On a given day the full time jobs advertised across Canada were about 52 in the select areas of geotechnique and minerals engineering. The snap shot did not capture green energy jobs, surveying jobs, land use planning , municipal environmental and engineering jobs or others that are specialized, like niche firms in engineering contracting, or public relations roles that our student aspire to. In the context of the snap shot a great deal of other comparative data was captured. The expectation is 15% more employment growth in applied earth sciences will occur yearly compared to most other technical employment, earth science occupations are cited as above average in salaries and long term job prospects, and about 24 % of the workforce in these roles are female, which is a higher percentage than most professional occupations. Salary range is from 12 to 57 dollars per hour; with the norm near 27. See the detailed information in the appendix. This information does not capture any of the seasonal or coop hiring occurring across Canada I applied geology or related fields.

Impact of Coop hiring:

Coop hiring, coming into year four of this initiative, will be founded upon 40+ employers who have already hired semester 2 students for meaningful geology work. In addition approximately 20 other firms/offices have carefully considered our students and, but for extenuating circumstances, would have taken on coop students. The impact of these past employers decisions has been that the program Faculty is fielding requests for coop students, and full time workers “off cycle” in the late summer, early Fall and in the winter. These work opportunities are promoted to the College by direct industry to college contacts and it is suspected some are not captured by job opportunity surveys. The preemptive direct solicitation of the industry to the College for workers, full time and now co-op , has , since the last program review in 2011/12 , shifted from April to Late December, to the current situation of late August. This shift has been noted in both the minerals and engineering sectors. It is thought to be a direct consequence of the success of our students. A list of co-op employers, and likely future employers, is in the Appendix.

Graduate Employment and the incentive to continue higher education:

Employment rates are tracked by Provincial Key Performance Indicator Surveys. From year to year the numbers of respondents may be statistically problematical, but the summation of the results over a five year period illustrates that it is a very high probability that graduates will be in a earth science occupation upon graduation, or immediately after yet higher education (as university). The feedback from graduates to the program supports the data. Coop employment has made this transition to full time work easier for ERT students. About 70% of those that have done coop reconnect with coop employers. A number identify what they do not like about a coop work place and seek other areas of geology as a career path. The conclusion one might draw is that the College is attracting career path individuals and is giving them decent support to open employment doors.

1.2 Liaison with Industry and Criticism of the Program

The program has had 40+ firms hire co-op students in the past three years, prior to that the program made more than 140 email, phone and personal contacts with earth science professionals to establish bona fide need and achieve coop approval. Every student is prepared by the college to search for work, succeed in an interview and win co-op employment. This process involves college personnel, guest speakers and alumni engaging the semester two students.

During the co-op work term, every employer provides written feedback about the students and suggestions for the program at least twice. Mentor and supervisors are queried about the student and the program verbally.

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Every co-op student provides further insights in group, and individual meetings with the program coordinator two to three times after the experience. Each student provides final written feedback.

There is a year round flow of job descriptions and work opportunities as are result of our students’ quality work. This activity informs the program of employment possibilities and changes in the work being done in the industry.

The net result is much more industry input to the college, than in the case of a conventional program. With this comes a drive to modernize and adapt to meet, as well as possible, industry recommendations. It also provides the students with many more direct forums to express an opinion.

2.1 The Curriculum Framework

The program is academically weighted heavily in the use of math, statistics, chemistry and physics. It has significant skills training with respect to laboratory and field tasks that engineering and exploration companies could have a very junior employee do. These skill sets are largely delivered in Semester 2, 4 and 5. In semester 2 the College is providing fundamental skills to attract employers to the potential benefit of the students. In addition there is a large emphasis on safety, documentation and following testing and observation protocols. Concurrently the student is being assisted to find co-op employment. After the co-op work term the student is challenged to integrate the work and school experience, share knowledge with others in the class. In addition the student starts to acquire analytical skills and more basic techniques.

The following is syllabus of the skills and theory imparted prior to the co-op work term.

See the EXCEL spreadsheet that follows for the “Curriculum Map”.

Earth Resource Technician, Co-op

Skills gained from Fleming College Prior to the Co-op Work Term

Assuming the student has completed all course work and attended all classes, the student should have reasonable capacity to do the following work with supervision and coaching.

To the reader: Please recognize that the College follows practical, standard laboratory and field procedures (such as those prepared by ASTM). The practices learned may not follow the protocols of your workplace. However, the student’s fundamental knowledge should be quite good and their capacity to learn has been established.

Soils:

Introductory to decent Knowledge of density, moisture content, relative density, porosity, unit weight , void ratio, and the hydraulic conductivity, seepage velocity of water in soils

Calculating and plotting grain size distributions, sand gradations, sand and gravel gradations, hydrometers, combining gradations, using grain size distributions, specification envelops, engineering characteristics of soils, optimum construction materials

Knowledge of borrow/fill calculation, standard proctor test ( integrating theoretical results with observations during the test), in-situ moisture content, usable ranges of moisture content in earthworks, introduction to field testing and decision making, introduction to nuclear density testing.

Test pit logging in the context of pipeline construction, sampling soil, water, and for contaminants in the atmosphere during excavation, locating and clearing underground services, understanding construction requirements and potential responsibilities, safety in trenching or in pits and quarries. Work with the backhoe operator to excavate a test pit, safety concerns working with heavy equipment. Witnessed heavy compactors and other construction equipment in action.

Introduction and very preliminary practice concerning field testing and sampling observations, and inspection responsibilities for placing Portland cement concrete. Watch and review several videos concerning Safety on construction sites related to concrete placement

Analysis: can determine if a soil is appropriate for the use intended, understands the importance of the gradation of a soil.

Rocks and Minerals and Exploration:

Relates minerals in soils and rock to material fundamental observations concerning strength and chemical stability. Relates minerals to site water chemistry. Recognizes about 45 minerals and can recognize differences in rock type. Has some fundamental understanding of bedrock structures and some guidance of where to look for some mineral resources. Has been introduced to field structural measurement, strike and dip, and the geological map.

Can measure hardness, observe mineral cleavage and use it to name minerals, has a working knowledge of mineral oxidization and significance of mineral “blooms”

Has worked with maps for compass orienteering and has been exposed to many examples of plan and x-section views of geology and construction. Has some skill in using air photos and determining area measurement using map and photos.

Has an introduction to geotechnical drilling, test pitting, and water well drilling.

Ground water:

Has a framework knowledge of ground water and subsurface characteristics with respect to the quantity and speed of ground water flow. Can work out a 3 point problem to simply model ground water conditions under ideal conditions.

Other industry relevant exposure:

Has learned some safety practices with respect to construction, mining, mineral exploration sites, and environmental assessment site work from persons working in those roles.

Pipetting, titration, and other water chemistry measurements, pH, conductivity, alkalinity and basic observations have been practiced.

Has accomplished many technical math and introductory statistics calculations, rearranged equations and had some exposure to problem solving and using empirical equations. Has some knowledge of reading testing protocols and checking for the precision and accuracy required to develop reportable findings to clients.

The student has written about 8 typical memos to clients to report soils analysis, compaction results and other laboratory practices the student has worked on.

These students have all had slight exposure to geographic information systems software and quite a bit of useful training in excel spreadsheet and use of these in lab reporting.

The student has developed capacity to write and fill in standard forms, and the self- motivation and determination to query the employer immediately when the student’s knowledge is insufficient to go forward with a decision or work.

**The Curriculum Map:**



2.1B Accreditation Standards:

The program is a provincially accredited co-op program and the college must conduct the business of the program in an organized and rigorous manner. The content of the program follows, in part the provincial standard for the civil engineering discipline, and provincial standards and expectations for generic studies and general studies. The program Faculty and content experts determine exemptions and equivalencies through alternate courses (on line for example), to insure parity is achieved. There is not a provincial standard for the program content. OACETT has the closest criteria for professional registration, either as mining technician or a geotechnical technician or environmental science technician. The colleges have not been receptive to ceding accreditation to that organization, though it is the provinces only professional designate for technician and technologist standing by law.

Thus accreditation currently rests in four areas, recognition by Universities, through MTCU, by virtue of Co-op accreditation and individually by our graduates registering and gaining legal professional standing through OACETT, P.Geol, or P.Eng..

1. The excellent relationship with Acadia University, combining credits for academic work well done at Fleming and co-op hours worked has resulted in the normal timeline to accomplish a University Degree in geology of 2 years at Acadia. This puts our graduates in a position to register as a Professional Geologist under statute in Canada. The co-op work contributes to professional geologist, P.Geol, registration too.

1. A number of the students will register with the Ontario Association of Professional Technicians and Technologists, which can lead to professional registration, again under statute, in those roles. Our students are not on fast track to achieve technologist standing with OACETT in the engineering disciplines because the College does not have a three year program in the geology disciplines.

Students are encouraged to join any engineering, geology or environmental association but are impressed with the knowledge that the professional standing they should work for is one they have earned that is legislated. That is, the Faculty promote to the students that they should aspire to standings as: professional technician, technologist, drilling certifications, professional engineer, professional geologist, surveyor or other designations that are in the form of a professional licenses, as regulated by law.

Scrutiny of the “Key Performance Indicators” surveys of 2010 to 2014 reveal some of the consequences to the College of delivering a co-op course, as this was the period of transition, where employers began to contribute directly to student education. It is the view of the writer that some of the KPI data is incomplete and that some parts of the curriculum are not assessed by the surveys. It is important to understand that the questions relating to student satisfaction are answered by second semester students that are completing a rigorous semester and searching for co-op employment. Unlike some other occupations, the applied geology firms generally do not hire until semester end. Consequently the angst is palpable through the winter semester as the students await the moment to interview.

The following are observations about the KPI data.

Notionally Sound Data:

Graduation Rate:

The five year average graduation rate is 71% per year for ERT, compared to the College average of 66%. It is not clear when this statistic is generated during the program annual cycle. In the context of a coop program, one should consider that, in addition to the normal expectation that some will not complete academic courses at the “normal”graduation date, the co-op work term completion is a mandatory part of the program. Some students are choosing to wait until after academic courses are finished to do the coop work term. Therefor it is the expectation that the graduation numbers, for spring graduation, be graduating. Some at each spring matriculation and others will graduate at a nontraditional time, as December. From a coordinators point of view the graduation rate published seems low. The annualized number should be near 80% of the semester 5 students.

Working Graduates:

Graduates of the ERT program are very successful getting work. For 30 + years, this has always been the case. The program success rate is an 87% employment rate in all careers. The SENRS average is 83%. Further it is noteworthy that about 10% of each graduating class is certain to stream directly to university into a science or engineering program.

Working in Applied Science Jobs:

The program percentage of graduates getting work in applied geology is 78 % in contrast to the average College result of only 53% of other program graduates winning work in their field of study. The past three years of the program analysis reveals a steady growth in the number of program related employers. This is a natural “ramping up” of employer interest resulting from student job searching and College contacts. The ERT students are self-motivated to be in earth sciences, and are being given skills, knowledge and support to push for work in their field. The employers are clearly recognizing this. However, there were always similar high employment numbers in the past, because the College was preparing the right people with relevant knowledge and skills.

The College Learning Environment:

Coop delivery has attracted quite competent students with high expectations. They are more mature and demanding of a quality environment. Further these students are encouraged, from the first meeting with ERT personnel, to be aggressive and to offer positive criticism. This support is part of encouraging them to win a job in applied geology. This character trait has to be applauded as they seek to win work with professional engineers and geologist, with only a brief introduction to the technology they are entering.

In the graduating year, this self- confidence grows significantly, based in part, on the 5 to 6 months coop work done in rather decent industrial settings. Year one students are well informed of the past year student successes. They already know there is a high likelihood that they can win a job! As the workplace is either scientific or engineering based these students anticipate good organization, current equipment and facilities, no significant content overlap, and Faculty who are more than “one question deep”.

KPI data reveals the following

a.Graduate Satisfaction with Generic Learning outcomes:, Program results were 83% generally satisfied. The College average result was 87%

b.Satisfaction with the overall learning experience, Program80%, and college 82%

c. Satisfaction with the teachers, Program 71%, college 75% (2nd semester)

d. Graduate Satisfaction with the Program, Program 82%, College 83%.

It is highly likely that the students responded to satisfaction questions a, b, and c based upon academic delivery issues at the College. They were not queried concerning 25 to 35% of their program hours, those being the minimum they experienced as coop students. That component of their education is assessed in detail by employers and their own self- reflection. The mid- term and final employer co-op reports included student comments about their experiences. That documentation revealed a generally very high level of mutual satisfaction; and only rarely evidenced shortfalls in either employer or student expectations. The net result, upon return to academic classes has been a more mature, and outspoken student group.

Looking more closely at the contrast between the 2008 KPI results and the 2014 ones above, one notes these things:

Less that 50% of the class responded.

The program, as compared to the College system, had no KPI performance issues with related to preparing students for a career in 2008 or now

The program, compared to the College system, is below average with respect to criticism of Generic and Vocational Learning outcomes. The graduating students in 2014 had several situations concerning academic delivery that caused some frustration with respect to this subject matter.

Based upon most of the first and second year class responding: Satisfaction with teachers diminished over the 5 year period. It is noteworthy that the full time compliment diminished over the period and several delivery issues plagued the program.

All the KPI data referenced above is available through Fleming Data Research. Included in the Appendix are variances highlighted in the last two years. Where the variances are more than 3% it is the stated intent that the College improve the standing by 3% per annum. In part, the few program Faculty can personally strive to improve KPI data, however , the infrastructure , program and capital funding, and renewal of Faculty are management elections within the current structure of the College. Currently all working on this program delivery are working to get the best possible performance from the resources available

This data comparison , over a five year period , offers some clues about appropriate courses of action, with the caveat previous noted; the program delivery and content is not the same now as five years ago.

Student satisfaction suggests it still requires some modification to keep the co-op student’s overall experience only slightly more trying than the average student. The Faculty have to be judicious in curriculum delivery and assessment choices to avoid overloading the students.

A dip in student satisfaction seen in 2013, has rebounded slightly in 2014. The program, in a more conventional college format, struggled to adapt to radical change a decade ago when the 3rd year of the program was terminated. The issue then was, what could be saved from the 3rd year experience, and if it were to be inserted into year one or two, how might that be done in a sensible fashion? In 2010, the Faculty took on the challenge again. This time, the intent was to cut out some curriculum and contact hours, and to substitute for College academic course work co-op learning. Here the students would get a minimum of 645 hours of paid work deemed equivalent, with technicians, technologists, scientists or engineers as mentors. The college is still in the process of striking a good balance for program delivery of academic courses. Further, on the basis of industry requests, courses are being re-sequenced to get more core content to the students before the coop work term (into semester 2). A consequence of re-sequencing is to make the compressed Fall semester 4 a little more varied in content, perhaps easing the workload at that time. Furthermore two courses are being team taught to bring more specialized expertise and content into the program, and gain emphasis on some of the basic skills.

3.0 Outcomes from 2009 Program Review and Ensuing Years of Curriculum Renewal:

The 2009 review listed a number of infrastructure and staffing deficiencies.

The same issues of laboratories without window curtains, labs with inappropriate seating and adverse seating arrangements, heavily used classrooms showing wear and tear exist today as in 2009. Digital hardware was finally upgraded and appropriately installed in 2013. The technical support for the program was reduced (in the case of some semesters non-existent) during this five year period. The difficulty of getting soil and rock into the labs, and maintaining any accessible stockpiles of these materials has not been solved. The Program Faculty was reduced to two full time professors after rising briefly to three. The goal of expanding the expertise of the Faculty was delayed as the Geophysicist that retired was not replaced. The deficiencies in software for a number of course have been reconciled by Faculty by developing spreadsheets and public access spreadsheet cases, and using student copies of software in others. The College did acquire about 20,000 dollars of capital equipment specific to program delivery. The staff has rehabilitated a number of pieces of equipment.

During the period, from 2009-2011 the Faculty, Management and Advisory Committee moved the program to a Co-op delivery model, as planned for in 2009. In the past 3 years academic delivery has involved shifting content and course deliveries to get the maximum education to the students, modified by what the Faculty has learned about the student’s work experiences, and following industry suggestions.

Industry guests have had some impact upon the program, generously providing current hardware and software to improve the students’ learning experience with respect to air and water monitoring. The more effective utilization of the senior chemistry professor has also complimented lab and field efforts to give students timely and relevant training.

Closer field areas where chosen for some geological training to increase the site time available to the students. The recommendations to increase rock and mineral training are underway and will be implemented in the winter 2015, enhancing both the semester 2 and semester 5 student’s capacity to know and use mineral matter.

In each of the past 4 years curriculum renewal documents have been filed with the Centre for Learning and Teaching. These chronicle the progress and challenges of cultivating those students who are aggressive, demanding and self-motivated for a co-op program.

In 2011 the Faculty first dealt with students returning to the “new” Fall semester, Semester 4. The students returned from work to 5 core geology courses in a 7 week time period. This semester is now it its 3rd iteration and has become better in each edition. Semester 5, the last winter of the student’s experience, has always been academically challenging. Faculty have to remember that ERT students have been solidly involved in their education continuously from September year 1 to April year 2 with little down time.

Lessons learned through the past 5 years:

Interview the students individually at the end of semester 5 and at the 1/3 point in semester 5. Guard against the College assigning courses to persons who are not technically and scientifically adept in geological applications of knowledge learned. Use learning software systems methodically to reduce student questions about content and assignments. Continue to treat learning as if it is happening in the workplace. Encourage decent completion of course outcomes. The issues related to co-op delivery are twofold. Most issues and problems can be dealt with using reasonable procedures to keep students on track to succeed. However a second set of problems, related to international students, employer/employee relations, and documentation really are outside of the coordinators role and capacity to respond, as they touch upon College policy and practices. The hiring, in 2014 of a co-op coordinator should ameliorate situations that are “one of policy questions.

The success of program changes during the five year period:

1. The Fall intake numbers, as influenced by program registration rather than the prior common first semester registration, have steadily grown from the low 20’s to the low 30’s with steady increase each year. The program has been held to 1 group of students to learn in a measured way the business and impact of co-op on the academic studies. The result of these September numbers has been, in 2012, 2013 and 2014, a January compliment of 38, 34, 34 (with the addition of direct entry and drilling students). It has been clear in 2012, 2013 and 2014 some additional (international students) persons were available to enter the program but were unable to meet visa requirements. Enquiries for information, made directly to the coordinator, have climbed to well over 100 per year, compared to about 20 in 2009.
2. The number of students presenting resumes to industry has risen from 24 graduates a year to about 50 graduates and co-op students per year. The employee pool has doubled for industry.
3. The Students are hired through College contacts in most cases, but in each of the last three years students have won work in the minerals industry, the pipeline industry in western Canada and with smaller specialty companies that are all now newly informed about the ERT program and Fleming College.
4. The college has learned from timetabling, curriculum overlaps and delivery issues how to accomplish the changes in program and garner reasonable student satisfaction.
5. The program enjoys above average to top incomes for graduating technicians and the percentage of graduates proceeding into an applied geology job is up slightly from pre co-op years.
6. Most students get very good midterm and final reviews from employers, strengthening their self-confidence.
7. The college has determined to see growth in the program to two groups, meaning 42 to 60 students will be involved in Co-op going forward, on the strength of what has been learned to this point.

The changes that have occurred since the last program review have been considered carefully by the program advisory committee. The program coordinator has received critical feedback from industry and students regarding the program, specific curriculum and the co-op experience.

The curriculum changes going forward are:

Significantly increased content and rigor in semester 1 preparation courses.

Increasing rock and mineral and exploration content

Increasing soils and aggregate training, and pavement design

Easing the workload on students in semester 5

Improving laboratory facilities

Diversifying the curriculum to make it available to students in more ways

Being more proactive regarding curriculum overlap, timetabling and Faculty support in

core program courses, but also, critically in courses like statistics, chemistry, communications.

Checking with hiring managers concerning contract faculty hiring.

Further developing alternate pathways in terms of timing for the coop component and exploring a non-co-op program completion process. See a draft of this topic in the Appendix

Moderately increasing field work time with the students.

Providing detailed expectations regarding co-op course sequencing and providing alternate times to get this program component completed.

Continuing to influence conditions of delivery to make the program more favorably viewed by a higher proportion of the students.

Appendices:

2014 Winter, Advisory Committee Minutes(a second meeting occurred in late Fall 2014)

Key Performance Indicators, variances noted by Fleming Data Research.

Fall 2014 Employment “Snapshot”, independent research by Fleming Library Services

Course Layout and Curriculum Map

Pathways for a Co-op student to accomplish the work term

List of companies That Have Hired Co-op Students

An Abbreviated List of College Industry Contacts