

Response to Review of Undergraduate Programs in Earth Sciences Action Plan - June, 2015

On April 27, 2015 the Department of Earth Sciences was informed that the fall 2014 cyclical program review, carried out in accordance with article 5.1.9.12 of Carleton's Institutional Quality Assurance Process (CUCQA), categorised the undergraduate programs in Earth Sciences as “**good quality**”. The department was asked to develop an action plan to address the following recommendations, and to report annually.

Recommendations:

1. Define course-level learning outcomes and map these onto the program outcomes;
2. Seek strategic replacement of retiring faculty member;
3. Add new faculty in “softrock” geology, nanotech or medical/health geology;
4. Work with Dean and Advancement to secure an Endowed Chair in Resource Geology;
5. Hire full-time Laboratory Coordinator for 1st-year Earth Sciences and 2nd-year Engineering Geoscience laboratories;
6. Seek commitment from Administration for replacement of retiring technical staff;
7. Secure suitable, perennially dry storage space for samples and field equipment;
8. Seek commitment from Administration for the acquisition of research instruments for recent faculty hires;
9. Seek commitment for the acquisition of new research instruments for teaching and research;
10. Publish a 2-year “look-ahead” course schedule for students to facilitate planning;
11. Define methods of assessment for course and program learning outcomes;
12. Establish a ‘Welcome to Earth Sciences’ event at the end of the 1st year to provide students with an overview of what to expect in 2nd, 3rd and 4th year;
13. Provide 2nd and/or 3rd-year students with short-courses or mini-workshops focusing on useful software tools;
14. Investigate with Geography the feasibility of a double major in Earth Sciences and Geomatics;
15. Conduct exit interviews with your graduating 4th year students.

The Department of Earth Sciences is in agreement with the recommendations proposed by the External Reviewers. The following document, providing our responses to the recommendations, was developed in 2015 and hereby updated in 2016 by the Department of Earth Sciences in collaboration with Dr. Butler, the Dean of Science. Please see Table 1 for a summary of our responses with assignment of responsibility and time lines for each recommendation.

Replies to recommendations:

1) Recommendation: Define the course level learning outcomes and map course level outcomes onto the program outcomes.

Reply: We see this as a constructive tool for evaluating our curriculum and ensuring that our courses dove-tail with each other. This major project is in progress. We have addressed the first part of this recommendation for our B.Sc. H. program. During 2015-16, with the advice of Mr. Patrick Lyons and Ms. Samah Sabra of EDC and the coaching of Ms. Sabra, we have defined course learning outcomes for the Earth Sciences courses in our B.Sc. H. program. We are currently working on the second part of the recommendation; the mapping component. In the spring of 2016 we embarked on mapping course learning outcomes back to the program outcomes with the advice of Ms. Andrea Thompson [Program Assessment Coordinator, Office of the Vice-Provost and Associate Vice-President (Academic)] and are continuing under the guidance of Dr. Anthony Marini (EDC). This will be completed during the 2016-2017 academic year.

2) Recommendation: Seek strategic replacement of retiring faculty member with expertise that complements that of existing faculty and that supports the undergraduate program.

Reply: We intend to provide a rationale and make a formal request on a case by case basis as faculty retire. We have the support of the Dean of Science to strategically replace upcoming retirements. We

recently sought and were granted permission to replace one resignation and one retirement. Job competitions for these two positions are in progress.

3) Recommendation: Addition of a new faculty in “soft rock” geology (e.g., Petroleum Geology, siliciclastic sedimentology), nanotech or medical/health geology to capture existing or emerging demands in the Earth sciences.

Reply: Given that we are below critical mass to deliver core courses for our professionally accredited Geoscience programs, we rank positions that contribute to these programs (i.e. Petroleum Geology - siliciclastic sedimentology) over those that may take us in new directions. In 2015-16 we proposed a Banting Fellow for a Petroleum Geologist, but we were unsuccessful. We intend to provide a rationale and make a formal request to the University for a Petroleum Geoscientist in the next budget cycle, and will continue to seek opportunities in support of such a new position.

4) Recommendation: Work with the Dean of Science and Advancement Officers to secure funding for an Endowed Chair in Resource Geology (unique to region).

Reply: We continue to approach philanthropists who may support the Endowed Chair, seek out ‘connectors’ that may help us identify prospective donors, work developing better connections with our Alumni, and continue to improve our image and publicize the department’s achievements.

5) Recommendation: Hire a permanent, full-time Laboratory Coordinator for 1st year Earth Sciences and 2nd year Engineering Geoscience laboratories.

Reply: The recommendation is fully satisfied. The position was approved in the fall of 2015, and was advertised and filled in the winter of 2016.

6) Recommendation: Secure commitment from the Administration for the strategic replacement of retiring technical staff.

Reply: The next foreseeable retirement is Mr. Peter Jones, our microprobe specialist. Dr. Butler, the Dean of Science, recognizes that this position is built into the base budget and sees no reason that this position may not continue.

7) Recommendation: Secure suitable, perennially dry storage space for irreplaceable geologic samples and expensive field equipment.

Reply: The Dean of the Faculty of Science and the Chair of the Department of Earth Sciences continue to liaise with strategic planners, Facilities Management Planning, etc. to find solutions to this untenable situation. This issue has been flagged to the architects working on the Herzberg Building component of the campus renewal project

8) Recommendation: Seek confirmation and a commitment from the Administration for the acquisition of research instruments for recent faculty hires.

Reply: The Dean of the Faculty of Science reiterates his pledge to support New Faculty in their acquisition of research facilities through support of instrument applications to funding agencies, as those opportunities become available. For example, in support of the Geochemistry hire in progress, the Dean of Science has authorized purchase of a Neptune mass spectrometer that unexpectedly came on the market in Ottawa in 2015. The instrument will be installed in the fall of 2016.

9) Recommendation: Seek confirmation and a commitment from the Administration for the acquisition of new research instruments for teaching and research: namely, XRF hand-held analyzer and ITRAX core scanner.

Reply: The department is in the last phase of a three stage renovation and expansion of student space, common space, teaching space and research space. We have outfitted an Honours Research Laboratory with very high-end computers and microscopes specifically for student use. In the case of the XRF hand-

held analyzer, the Dean of Science has agreed to make this a funding priority in the 2016-17 and 2017-18 budget cycles. In the case of the ITRAX core scanner, Dr. Patterson has put an interdisciplinary team together and applied for fund for this equipment as part of a larger CFI proposal.

10) Recommendation: Publish and update, on a regular basis, a 2-year look-ahead course schedule so that students can better plan their preferred sequence of courses, particularly when courses are cycled.

Reply: We have addressed the underlying problem via other means. This criticism mainly pertains to our 4th year course offerings. Compared to the ~10 year time period that was under consideration for the cyclical review, we have now stabilized our course offerings considerably; we have built up a roster of 4th year courses that are offered annually. We are planning as much of our course delivery as possible on a two-year cycle, communicating the availability of courses to students well in advance, and counselling students. However, there are operational limitations which cannot be overcome regarding scheduling of 4th year courses more than one year in advance (e.g., funds for contract instructors are approved on an annual basis; our teaching assignments are finalized less than one year in advance of each academic year; and we are notified of fourth year courses offered in the Joint Institute, the Ottawa Carleton Geoscience Centre, by U of O, on relatively short notice, etc.).

11) Recommendation: Define methods of assessment for course and program learning outcomes for all programs.

Reply: We see these as tools for getting concrete feedback about course and program delivery in order to improve the quality of our courses and programs. This major project is in progress. We have a plan to assess program learning outcomes. Some assessment tools are in place (e.g. Honours theses, Honours student publications, etc.), some data are now being compiled annually, some assessment rubrics have been developed and are being tested, and others will be embedded once course learning outcomes and mapping of course outcomes to program outcomes are complete (Recommendation 1). We have data-base archiving issues yet to overcome.

12) Recommendation: Establish a 'Welcome to Earth Sciences' gathering (event?) at the end of 1st-year designed specifically to provide an overview of what to expect in 2nd, 3rd and 4th-year, including Field Geology at the end of 2nd-year, and how best to navigate course selection, as well as scholarship and summer internship opportunities.

Reply: This has been instituted as an annual event starting in 2014-15, and we plan to continue. Dr. Claudia Schroder Adams with the support of the Departmental Administrators, Chair and Undergraduate Advisor hosts a mandatory information session and luncheon.

13) Recommendation: Provide 2nd and/or 3rd-year students with short-courses or mini-workshops focusing on useful software tools.

Reply: We believe we have addressed this recommendation via means other than the recommended model. We have had GEOM 2007 (Geographic Information Systems) moved into the fall term of second year to prepare students for subsequent courses (e.g. EARTH 2406 and 2802). We include such software training in a new fall term course, EARTH 4820 Research Methods in Earth Sciences, and we encourage all 3rd year students to take it. We have purchased a portable 20-seat computer lab, and this, in conjunction with courses or labs scheduled in other Faculty of Science computer labs, has increased our incorporation of software use into our formal program (e.g. courses, labs, field schools and student research). We provide access to computers "fully loaded" with appropriate software via a new Honours Student Laboratory. The short-course or mini-workshop model didn't work for us and we have discontinued it. In 2014-15 and 2015-16 we put on a robust mentorship program in our department that included training on software tools; however, we have cancelled this due to poor engagement of students in this voluntary program, despite scheduling topics and timing of workshops conforming to those requested by students.

14) Recommendation: Investigate, in conjunction with Geography, and introduce, if feasible, a combined major in Earth Sciences and Geomatics (or concentration/minor in Geomatics) that would appeal to students and reflect demand by employers.

Reply: Representatives of the Department of Earth Sciences liaised with GEOG/GEOM in the 2015-16 academic year. In collaboration with GEOG, we have taken a two-stage approach. First, we wanted to find out if we could modernize and update our existing combined program in Earth Sciences and Physical Geography, include a GEOM component and bring the program into compliance with the professional Geoscience Environmental Stream. We have done so and as of June 2015, this program revision has been submitted by the departments of EARTH and GEOG for academic approval at the faculty and university levels. Secondly, we are investigating the possibility of a combined EARTH GEOG program with a GEOM concentration, or a combined EARTH GEOM program. We have realized such programs must conform with professional Geoscience academic requirements in order to be viable (i.e. appeal to students and potential employers). Note that there is a GEOM minor which a number of Earth Sciences students take which would satisfy the purpose of the recommendation. We are pointing this opportunity out to our students when we mentor and counsel them.

15) Recommendation: Conduct exit interviews with your graduating 4th year students; they will provide thoughtful suggestions for continued improvements, as well as long-term community building with your newly minted alums.

Reply: This project is in progress. We are informally soliciting comments from our undergraduates but have not yet formalized this. We are focusing on a web-based exit survey which is currently in review within the department and if acceptable will be implemented in 2017. It is based on an exit survey that has recently been developed as part of a national move by Earth Sciences Departments (via the Council of Canadian Earth Sciences Chairs and the Canadian Federation of Earth Sciences) to carry out exit surveys in parallel with a US program. The proposed web-based survey has been developed with standardized questions, for Canadian Universities, to collect information about how students are attracted to a program and where they end up being employed as well and a section that may be adapted for specific universities and departments. Note that the compliance to FIPPA and other regulations may be prohibitive.

Table 1: Summary of recommendations, response and time lines.

	Recommendation	Action	Responsibility	June 2015 Estimated Timelines	Revised Timelines June 2016
1	a. Define course-level learning outcomes and b. Map course-level outcomes onto the program outcomes	Define course-level learning outcomes, map course-level outcomes onto the program outcomes with curriculum discussions, revise course outcomes as needed and include in course syllabi	a. Chair, Faculty, Contract Instructors b. Chair, Faculty	a. October 2015 b. January 2016	a. May 2016 b. May 2017
2	Seek strategic replacement of retiring faculty member	Present rationale and request to administration upon notification of Faculty retirement	Chair (representing consensus of Department) & Dean of Science	Case by case: as soon as Faculty notifies university of retirement	Case by case: as soon as Faculty notifies university of retirement
3	Add new faculty in "softrock" geology, nanotech or medical/health geology	Present rationale and request to administration; seek funding opportunities for new positions (e.g. Banting)	Chair (representing consensus of Department) & Dean of Science	Initiate immediately; ongoing until successful	Ongoing until successful
4	Work with Dean and Advancement to secure an Endowed Chair in Resource Geology	Approach philanthropists; identify 'connectors'; build Alumni network	Chair and Dean of Science	Ongoing; continue until successful	Ongoing; continue until successful
5	Hire full-time Laboratory Coordinator for 1st-year Earth Sciences and 2nd-year Engineering Geoscience laboratories	Permission has been granted by Dean of Science for 2015-16 budget cycle	Chair, Human Resources staff & Dean of Science	Ongoing; position will be created ASAP.	Completed. Position has been created and filled.
6	Seek commitment from Administration for replacement of retiring technical staff	Present rationale and request to administration upon notification of staff retirement	Chair & Dean of Science	Case by case; : as soon as staff notifies university of retirement	Case by case; : as soon as staff notifies university of retirement
7	Secure suitable, perennially dry storage space for samples and field equipment	Ongoing: requests are being put forward to strategic space planners and upper administration by Dean of Science	Chair & Dean of Science	Ongoing; continue until successful	Ongoing; continue until successful
8	Seek commitment from Administration for the	Prepare proposals in conjunction with	PI & Dean of Science	Case by case	Case by case

	acquisition of research instruments for recent faculty hires	Research Services			
9	Seek commitment for the acquisition of new research instruments for teaching and research	Prepare proposals in conjunction with Research Services; include minor needs in annual department budget requests.	a. XRF analyzer, Dr. Brian Cousins & Chair b. TRAX core scanner, Dr. Patterson (PI) & Research Services	a. 2016-17 or 2017-18 as funds available b. 2016-17	Major renovation and upgrade of department space 2014 – 2017. a. Space, computers & microscopes supplied in 2016. Other acquisitions are in progress for June 2018 b. CFI submitted 2016
10	Publish a 2-year “look-ahead” course schedule for students to facilitate planning	Proactive student counselling, establishing regular patterns of fourth year course delivery	Undergraduate Administrator (Ms. Sarah Adams) under direction of Chair & Departmental Administrator (Mrs. Sheila Thayer)	Fall 2015	Underlying issue has been addressed <ul style="list-style-type: none"> • Stabilized fourth year course offerings • Built flow charts for each program • Established proactive student counselling
11	Define methods of assessment for course and program learning outcomes	Establish and implement assessment protocols for evaluating program learning outcomes	Chair and Department Faculty Members	Fall 2016	In progress. Completion of project expected by Fall 2017.
12	Establish a ‘Welcome to Earth Sciences’ event at the end of the 1st year to provide students with an overview of what to expect in 2nd, 3rd and 4th year	Schedule annual mandatory class meeting with 1 st year students	Dr. Claudia Schroder Adams with Undergraduate Supervisor and Undergraduate Administrator (Ms. Sarah Adams)	2015-16 Academic Year	Established as an annual event with mandatory attendance for students in our programs.
13	Provide 2nd and/or 3rd-year students with short-courses or mini-workshops focusing on useful software tools	Integrate software training and use into core program. Provide student access to necessary programs and	Chair and faculty	2015-16 Academic Year	Underlying issue has been addressed. Software tools are integrated into formal course

		computers. Implement Research Methods Course.			delivery, and are made available to students for courses and research. <i>Note: the voluntary workshop model was tried for 2 years, unsuccessful due to lack of student participation and discontinued.</i>
14	Investigate with Geography the feasibility of a double major in Earth Sciences and Geomatics	Set up exploratory meetings with Geography and is successful, plan and propose a joint program	Chair Undergraduate Advisor, Curriculum Committee	2015-16 Academic Year	1) Revised and updated combined program EARTH – Physical GEOG proposed by EARTH and Physical GEOG – IN REVIEW 2) program with EARTH & GEOG/GEOM is under discussions at the department level with agreement in principal to go forward in 2016-17.
15	Conduct exit interviews with your graduating 4th year students	Develop exit survey protocols; Adapt existing Geoscience surveys for our department purposes	Dr. Brian Cousens, Ms. Beth Halfkenny, (Ms. Sarah Adams)	Spring 2017, or sooner	Spring 2017. Preliminary draft of survey is in review. Compliance with privacy and legal considerations may be prohibitive.