

# Final Assessment Report

## Earth Sciences

### Graduate and Undergraduate Programs (reviewed 2019-20)

#### A. Summary

1. The Department's Self Study was considered and approved by the Senate Academic Review Committee on January 7, 2020.
2. The Review Committee consisted of two external reviewers: Janok Bhattacharya (McMaster University) and Mostafa Fayek (University of Manitoba), and one internal reviewer, Mark Spencer (Brock University).
3. The site visit occurred on June 24-25, 2020.
4. The Reviewers' Report was received on July 3, 2020.
5. The Department response was received on July 28, 2020.
6. The Senate Undergraduate Program Committee response was received on July 22, 2020.
7. The Senate Graduate Studies Committee response was received on September 17, 2020.
8. The Dean of Graduate Studies response was received on September 25, 2020.
9. The Dean of Mathematics and Science response was received on September 28, 2020.

This review was conducted under the terms and conditions of the IQAP approved by Senate on May 25, 2016.

## Program Outcome Categories:

Based on their knowledge of the discipline, the content of the Self-Study and the interviews conducted during the site visit, the Review Committee gave the programs the following Outcome Categories:

Program(s)	Excellent Quality	Good Quality	Good Quality with Concerns	Non-Viable
MSc			X*	
BSc (Honours) Earth Sciences			X*	
BSc (Honours) Earth Sciences Co-op			X*	
BSc (Honours) Environmental Geoscience		X		
BSc (Honours) Environmental Geoscience Co-op		X		
BSc (Honours) Combined		X		
BSc (with Major) Earth Sciences		X		
BSc (with Major) Environmental Geoscience		X		
BSc (Pass)		X		
Minor		X		

\*The Reviewers indicated that their concerns were mostly related to enrolment and faculty resources. They acknowledged that the programs are in strong competition for students and suggested some new strategies to enhance enrolment. The Reviewers also suggested that the Department hold a retreat and develop a strategic plan for the future, including faculty renewal and maximizing available resources fairly.

## Executive Summary:

The Reviewers wrote:

The Department of Earth Sciences boasts a high teacher to student ratio, are campus leaders in experiential learning, and are strong in research, despite lacking a PhD program. They have been innovative in developing on-line service courses that improve the viability of the unit, but continue to be hampered by low enrollments of undergraduate majors, which appears to be the most significant criteria for defining success at Brock. Greater attention to the NWS may help better reconcile the balance between undergraduate and graduate teaching, and research. This approach will help Brock to be recognised as a leading Canadian comprehensive University. The Department is plagued by a lack of faculty diversity, and especially a lack of junior faculty. The Department should prioritize developing a long-term hiring and replacement strategy focussed on areas of current and anticipated future departmental strength. A facilitated retreat, in consultation with the senior administration may help the unit plan for the future with greater buy-in from the senior administration, and may be critical for planning future resource allocations that fit the broader university mission as well as addressing departmental needs.

## B. Strengths of the Program

The reviewers noted the following strengths:

- (1) High teacher to student ratio. Students receive far more one-on-one teaching and supervision relative to larger departments in Ontario (e.g., Univ. Toronto).
- (2) Most of the faculty (6 of 8) are funded by NSERC and are active in research.
- (3) Experiential learning has been a large component of teaching in the Department.

## C. Opportunities for Improvement and Enhancement

### Recommendation #1

Unit should define their strategic niche, especially in the context of competition with other universities in southern Ontario. Emphasis could be in Environmental geoscience, Quaternary geology, Palynology, remote sensing, in conjunction with Geography appointments, and linked to planetary science.

The Department stated:

The department has long recognized the need to differentiate itself from other departments of Earth Science in southern Ontario. The resignation of [a faculty member] has made it difficult to continue offering a PGO-compliant program in Earth Science but we have substantial depth and breadth in Environmental Geoscience making this program viable, particularly in conjunction with offerings in other programs at Brock, notably Geography and Tourism, Biological Sciences, and Chemistry. It may be possible to better promotion of these areas of strength, although the degree to which this might resonate with potential applicants to Brock (and their parents) is unclear. (In contrast, around fifteen years ago, when [a faculty member] was President of Geoscientists Canada and 'hard-rock' and traditional geology appeared to be somewhat diluted at McMaster University after Geology merged with Geography, the department agreed to focus on offering PGO-compliant programs in Earth Science and Environmental Geoscience. This career-focussed approach proved to be a useful tool in recruiting and retaining good students while Canada's resource-based economy continued to thrive.)

The Dean of Mathematics and Science responded:

The Dean's Office is satisfied with the departmental response and will leave it to the department to develop their plan to accommodate this recommendation, to the extent possible within the available resources.

The Dean of Graduate Studies responded:

The Faculty of Graduate Studies supports the Department as they continue to identify their niche and intersect with other units. While this recommendation falls outside of FGS' mandate, we are willing to engage with the MSc program to help promote research opportunities for Graduate Students that align with expertise in the ERSC.

### ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation. The Committee recognizes that the Department has already taken steps toward occupying a niche, such as the proposal for a new BA in Earth and Planetary Science Communication, which is undergoing the review process in 2020. The Committee expects that the definition of a strategic niche will require a number of years of development by the Department.

**Implementation Plan (3<sup>rd</sup> Priority)**

Responsible for approving:	Department
Responsible for resources:	Department
Responsible for implementation:	Department
Timeline:	Dean of Mathematics and Science to report by the end of academic year 2022/23

## Recommendation #2

Unit should develop a 5-10 year hiring strategy, focused on their strategic niche as well as possible future retirements. The rationale for each hire should be justified based on the unit's own strategic plan as well as linked to the overall mission and strategic university plans.

The Department stated:

This recommendation touches on many sore points, most of which are beyond our sphere of influence.

- 1) We agree that a plan for faculty renewal would provide a sense of long-term viability, tying new positions to areas of strength that differentiate us from other departments in Southern Ontario, would improve morale and probably help us in recruiting more (and higher quality) students to our programs. We have long been told that recommendations for faculty renewal will not be considered by Administration, and that the only way to compete for faculty positions is to demonstrate demand for programs - a 'catch-22'. While our lucrative, high-enrolment online courses balance our books, they do not require that tenure track faculty be hired to deliver them, even as our numbers are projected to decline between now and the next projected review.
- 2) The concept of 'teaching faculty' has not been accepted by the BUFA membership, so hiring permanent (tenure-track) teaching staff who would teach 5-6 courses per year is not a viable option.
- 3) While the positions of cartography/ draftsman and departmental technician are somewhat unique to Brock, and a historic artefact, most of us view the existence of these staff members as one of the few supports we have in conducting our research (and they also facilitate our teaching of upper-year undergraduate and graduate courses). The reviewers noted that most of our faculty are active researchers funded by NSERC and other sources, despite our high teaching loads and little recognition of the effort that goes into graduate teaching, supervision and research. Taking away our few supports and providing us with colleagues who could teach more undergraduates is of little value to most of us, and of questionable value to the programs. It should also be pointed out that our thin section technician does outside contract work, which subsidises his salary. In addition, he is the departmental safety officer and manages and maintains all departmental equipment. Our cartographer/ draftsman also does work for the Faculty of Mathematics and Science and to assist us with delivering courses, which will become increasingly important in our transition to online teaching.

The Dean of Mathematics and Science responded:

The Dean's Office agrees with items 2) and 3) of the departmental response. The Dean will discuss availability of any resources related to item 1), including ILTA positions(s).

The Dean of Graduate Studies responded:

Hiring decisions fall outside of FGS' purview, however, a hiring strategy that helps to enhance and create new research opportunities for graduate students is supported.

### ARC Disposition of the Recommendation

ARC considers the recommendation to develop a 5-10 year hiring strategy to be accepted and in the process of implementation. The Committee recognizes that hiring lies outside of its jurisdiction and expects that the Department will proceed through normal channels of advocacy for faculty resources.

<b>Implementation Plan (1<sup>st</sup> Priority)</b>	
Responsible for approving:	Department
Responsible for resources:	Department
Responsible for implementation:	Department
Timeline:	Dean of Mathematics and Science to report by the end of academic year 2020/21

### Recommendation #3

The unit should investigate increasing opportunities for international enrollments, especially in niche areas (such as palynology) that can service an international need. Perhaps consider developing a 2+1 or 2+2 program. The aim should be to increase international students by 5-10.

The Department stated:

At the graduate level there has been considerable success attracting international students over the past 10 years in some fields, notably palynology and glacial micromorphology. We have had very mixed success with our international cohorts in the past, with a few of our best and several of our worst (i.e., most time-intensive) undergraduate and graduate students coming from outside Canada. We view this much like recommendation #1, and we agree that better promoting our areas of strength could allow us to attract more international students to Brock. It must be noted, however, that international graduate students are a much greater drain on the supervisor's funds and (as noted in our self-study) they commonly take substantially longer than the 2 years that are funded by the Faculty of Graduate Studies for a variety of reasons.

Note: none of us is clear what is meant by 'a 2+1 or 2+2 program'

The Dean of Mathematics and Science responded:

The Dean's Office will work with Brock International to explore the possibility of 2+1 and 2+2 programs.

The Dean of Graduate Studies responded:

Increasing the number of International Graduate Students aligns with the Strategic Plan and priorities. While I do appreciate the challenge around funding International MSc students, and I see the program has identified challenges around completion time, I do see this as an opportunity to discuss these issues to see whether there are creative ways to address these challenges.

### ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation.

#### Implementation Plan (1<sup>st</sup> Priority)

Responsible for approving:	Department
Responsible for resources:	Department
Responsible for implementation:	Department
Timeline:	Dean of Mathematics and Science to report by the end of academic year 2020/21

**Recommendation #4**

Examine strategies to increase undergraduate enrollment, and especially recruitment from 1<sup>st</sup> year students that transfer into the program, emphasizing niche areas of expertise.

The Department stated:

The majority of our majors have always come to us from other programs at Brock rather than into our Earth Science or Environmental Geoscience programs. We rely primarily on the experience they have in lectures and labs in ERSC 1P01 and 1P02 but also in second year courses that are commonly taken by majors in other programs (primarily Biological Sciences and Geography and Tourism). Much like our response to recommendation #1 (& 3), we agree that better promoting our areas of strength could allow us to attract more students from other programs.

The Dean of Mathematics and Science responded:

The department and the Dean’s Office will work together with recruitment to promote the program(s).

An application for major modification to the programs, related to changing the admission requirements has already been submitted for review by ARC. The Dean has provided the letter supporting the change.

**ARC Disposition of the Recommendation**

ARC considers the recommendation to be accepted and in the process of implementation.

**Implementation Plan (1<sup>st</sup> Priority)**

Responsible for approving:	Department
Responsible for resources:	Department
Responsible for implementation:	Department
Timeline:	Dean of Mathematics and Science to report by the end of academic year 2020/21

### Recommendation #5

Recommend a facilitated retreat to address recommendations 1, 2, 3 and 4. Retreat should include participation of jointly and cross-appointed faculty, especially in physical geography.

The Department stated:

We would be willing to participate in a structured and facilitated retreat to discuss ways of attracting more (and better) students into our programs and we would welcome an opportunity to present the Dean and upper administration with a hiring strategy to revitalize the programs.

The Dean of Mathematics and Science responded:

The Dean's Office is satisfied with the departmental response.

The Dean of Graduate Studies responded:

I support this recommendation.

### ARC Disposition of the Recommendation

ARC considers the recommendation to be accepted and in the process of implementation. The Committee understands that a Departmental retreat is just one of the options available in taking steps to address recommendations 1,2,3 and 4.

#### Implementation Plan (3<sup>rd</sup> Priority)

Responsible for approving:	Department
Responsible for resources:	Department
Responsible for implementation:	Department
Timeline:	Dean of Mathematics and Science to report by the end of academic year 2022/23

## Recommendation #6

We recommend that Brock University establish a student-supervisor agreement that is reviewed by both the student and supervisor at the start of the student's graduate program.

The Department stated:

We already maintain a paper trail like the one 'recommended'. Annual reviews are held with the Graduate Program Director and the entire supervisory committee, and the forms that evaluate student progress (or lack thereof) are passed on to FGS. Expectations are explicitly discussed at each of the meetings and forms pertaining to intellectual property are discussed and signed as part of a larger discussion around mutual responsibilities and expectations.

The Senate Graduate Studies Committee stated:

SGSC agrees that R#6 ... would be applicable to all graduate programs across Brock, and should be followed up by SGSC as one of their potential agenda items for 2020/21.

The Dean of Mathematics and Science responded:

The Dean's Office agrees with the departmental response. The recommendation is already in use, to all intents and purposes.

The Dean of Graduate Studies responded:

The Faculty of Graduate Studies is very supportive of a recommendation for a document that outlines the expectations between the student-supervisor. In conjunction with CPI, FGS is working on creating resources to support the supervisor-student expectations more in the form of a checklist or memorandum of understanding. We will invite input from all graduate programs as we develop these resources.

The annual review and progress forms are already in existence as outlined in the program's response.

## ARC Disposition of the Recommendation

ARC considers the recommendation to be already current practice at Brock. The Committee expects that the Department will benefit from ongoing efforts by the Faculty of Graduate Studies and the Centre for Pedagogical Innovation to improve and streamline these practices.

## Implementation Plan

No action required.

### **Recommendation #7**

The Department should develop an NWS that is reflective of the workload required in both undergraduate and graduate teaching and mentoring.

The Department stated:

We have repeatedly developed NWS plans that reflect true workload, in which the supervision and mentoring of research students and teaching low-enrolment graduate classes is appropriately rewarded, but they have been revised by the Dean. It is demoralizing to continue to ask for, and be denied, recognition for workload. Recruiting larger numbers of undergraduate and graduate students, as we did 10 years ago, merely results in a higher workload for research-active faculty, jeopardizing our chances of successfully competing for research grants. It should be noted that in the last year, the Dean of FMS has offered an award that could be used as teaching relief and that the new BUFA Brock agreement also includes similar opportunities. While these initiatives are appreciated, they do not address the systematic problems that little credit is available for graduate student supervision or for the fact that we have no fulltime staff that can help with lab support for course beyond first year courses.

The Dean of Mathematics and Science responded:

The Dean's Office will continue to work with the department in developing NWS plans that address workload as well as providing opportunities for teaching relief for student supervision, graduate and undergraduate.

The Dean of Graduate Studies responded:

Workload is not within the purview of the Dean, Faculty of Graduate Studies. However, I do agree that Graduate Student supervision is an important part of intellectual discovery and that the training of new generation scholars should be valued.

### **ARC Disposition of the Recommendation**

ARC considers the recommendation to be not accepted as it lies outside the jurisdiction of the Committee.

### **Implementation Plan**

Recommendation not accepted.

## D. Summary of Recommendations:

First Priority:

Recommendations 2,3,4

Third Priority:

Recommendations 1,5

Not Accepted:

Recommendation 7

No Action Required:

Recommendation 6