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MEMORANDUM

ATTENTION: Senate

TEL

FROM: Peter Keller, Vice-President, Academic and Provost, and Chair, SCUP

A handwritten signature in black ink, appearing to read "Peter Keller".

RE: External Review Mid-Cycle Report for the Environmental Science Program (SCUP 18-48)

DATE: December 11, 2018

TIME

At its December 5, 2018 meeting, SCUP reviewed the Mid-Cycle Report for the Environmental Science Program which resulted from its 2015 external review. The report is attached for the information of Senate.



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MEMORANDUM

ATTENTION: Peter Keller, Chair, SCUP

TEL

FROM: Wade Parkhouse, Vice-Provost and Associate Vice-President, Academic

RE: External Review Mid-Cycle Report for the Environmental Science Program

DATE: November 22, 2018

TIME

The External Review of the Environmental Science Program was undertaken in March 2015. As per the Senate guidelines, the Unit is required to submit a mid-cycle report describing its progress in implementing the External Review Action Plan. The mid-cycle report, together with a copy of the Action Plan approved by Senate, and the mid-cycle report on the Unit's assessment of its Educational Goals are attached for the information of SCUP.

c: Jeremy Venditti, Director of Environmental Science
Ingrid Stefanovic, Dean, Faculty of Environment

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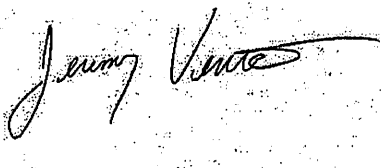
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MEMORANDUM

ATTENTION	Glynn Nicholls, Director, Academic Planning and Quality Assurance	DATE	November 21, 2018
FROM	Dr. Jeremy Venditti, Director, Environmental Science	PAGES	1/1
RE:	Mid Cycle Review Documents		

Attached please find the Mid-Cycle Report for the Environmental Science Program which details our progress with the Action Plan stemming from the 2015 External Review. The assessment of our Educational Goals is also attached.

Regards,



Dr. Jeremy G. Venditti

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External Review Update for the Environmental Science Program	
Action	Progress Made
1. Programming	
1.1.1 Undergraduate	
Action 1: With the support of the FENV educational consultant, the Director will review the EVSC curriculum in Spring 2016 as part of the educational goals and assessment process. If necessary, and in consultation with the EVSC Steering Committee, the curriculum will be revised to ensure that it provides the content and training needed to achieve the education goals of the program.	Completed Spring 2016. A curriculum map was developed and the program was streamlined. The revised program change became effective in Fall 2017. Realignment of the program concentrations to meet the educational goals is an ongoing process.
Action 2: Members of Biological Sciences and the EVSC steering committee will begin working together in Spring 2016 to make modifications to the Applied Biology concentration in the existing EVSC program, so that it better matches the educational goals, is distinguished from similar programming in Biological Sciences and so the concentration meets the needs of students interested in biological and ecological aspects of environmental science.	Following discussions with some members of BISC and REM in 2015 and 2016, an adhoc committee of applied biologists at SFU was struck to examine Applied Biology concentration content, make sure it was distinguished from BISC programming, eligible for accreditation by the College of Applied Biology and meeting the needs of modern environmental scientists. The adhoc committee met through 2017 and has proposed a series of changes to the EVSC steering committee that will be taken up at their Fall 2018 meeting.
Action 3: The steering committee and director will work on a mission statement in 2016, following the educational goals and assessment process.	Revision of the program-level goals was undertake in Spring 2016. These serve as a mission statement for the program until the formation of the School of Environmental Science is established in Spring 2019.
Action 4: Given the recommendation by reviewers to offer distinct courses to service EVSC majors and non-science students, a new course progression will be discussed by the steering committee in Spring 2016 that could include a team taught second year course, limited to EVSC majors.	Completed Fall 2016. The program change became effective in Fall 2017 which created a program cohort course progression that includes: EVSC 100: Introduction to Environmental Science; EVSC 201W: Environmental Science in Practice; EVSC 300: Seminar in Environmental Science; EVSC 305: Methods in Environmental Science; EVSC 400: Environmental Science Capstone; EVSC 490: Environmental Science Thesis (for honors).
Action 5: In response to the reviewers recommendation for revision of the experiential learning opportunities in the program, the option of moving 'Methods in Environmental Science' (EVSC 205) to the third year and replacing it with a	Completed Fall 2016. The program change became effective in Fall 2017.

second year course that focusses on field trips and demonstrations will be discussed with the steering committee in Spring 2016.	
Action 6: To better accommodate the need for a discussion forum of the science behind high profile environmental problems, the option of replacing the one credit seminar courses (EVSC 399 and 499) with a three-credit, third year seminar course will be discussed with the steering committee in Spring 2016. The course could serve as a forum for discussion of the science behind high profile environmental problems with discussants invited from academia, NGOs, community groups and industry.	Completed Fall 2016. The program change became effective in Fall 2017. EVSC 399 and 499 were replaced by EVSC 300 which is now taught in the Fall and Spring terms. Topics of EVSC 300 have included Climate Adaptation in Canada and the Environmental Impacts of BC Hydro's Site C Dam.
Action 7: A new capstone project-based course that will bring together the entire cohort of EVSC students from all the concentrations to work together will be discussed with the steering committee in Spring 2016.	Completed Fall 2016. The program change became effective in Fall 2017. The new cohort course will be first taught in Spring 2020 to coincide with students who have progressed to 4 th year of the new program. An instructor has not yet been hired.
Action 8: Options for the addition of environmental-focused courses on computer programming, modelling, statistics, social science and chemistry will be discussed by the steering committee and during meetings with partner units, Chemistry and Archaeology in Spring 2016.	Discussions on these issues are ongoing. Most units involved in focus areas are operating above their teaching capacity and have been reluctant to offer courses for students outside their discipline, but there appears to be a willingness to do so, should teaching capacity increase.
Action 9: To help to facilitate coop and career opportunities for EVSC students, the Director will establish an advisory committee in 2017 made up of industrial partners, leaders of NGOs and select government agencies who hire EVSC students.	This advisory committee will be formed following the formation of the School of Environmental Science.
Action 10: Accreditation of all concentrations by ECO Canada is being pursued with a planned site visit in Fall 2016.	This process was halted pending a review of the benefits to students of ECO Canada accreditation. ECO accreditation does not yet appear to be required by any municipal, provincial or federal statutes.
Action 11: An accreditation application for the Applied Biology concentration by the College of Applied Biology (CAB) was submitted in Summer 2015 and is under review.	The CAB assessment indicated conditional approval for students undertaking some additional coursework. The proposed revision to the Applied Biology concentration will allow for unconditional approval by CAB.
Action 12: In Spring 2016, the Director will meet with the Chair of Earth Sciences to explore options for a certificate or	Discussions on this topic are ongoing.

post-baccalaureate diploma that will allow students to apply for accreditation by the Association of Professional Engineers and Geoscientists.	
2. Research	
Action 13: The Director, steering committee and EVSC student union will meet in Spring 2016 to explore ways to promote more interaction between the EVSC undergraduates and environmental scientists on campus (e.g., one-day conference, seminar series, social events, etc.).	EVSC now holds a Town Hall meeting with students to discuss programming. Discussions about other community building activities are ongoing.
3. Administration	
Action 14: To help to facilitate program growth in a sustainable manner, the Dean's office has already agreed that the Director will have a two-course teaching reduction for the duration of his time as director.	No comment necessary.
4. Working Environment and Relationships of the Unit	
Action 15: The Director of EVSC will request meetings with each of the partner units, as well as the Departments of Archaeology and Chemistry, during the Spring and Fall 2016 semesters. The intention of these meetings will be to discuss each unit's vision, role, concerns, and contributions in regard to EVSC, with the goal of establishing long-term engagement in the program. Either the Dean or Associate Dean (Undergraduate) will aim to accompany the Director in these discussions, where the Director deems this to be necessary.	We did not do this. Instead we have maintained a line of communication with the unit Chairs and Directors through the Dean of FENV.
Action 16: The Director will request from the FENV Dean additional appropriate space in the TASC II building for a director's office, an office for a lecturer, a shared office for sessional lecturers and TAs, a student room, storage space and a teaching laboratory.	The FENV Dean has provided appropriately renovated space within TASC II for the new School of Environmental Science.

5. Future Plans for the Unit	
Action 17: The Director will meet in Spring 2016 with the FENV Dean and the steering committee to explore various governance (organizational) models for the Environmental Science program. Such a consultation process will ensure that the formation of any new governance structure maximizes the overall benefit to the Environmental Science program, as well as EVSC partner units and others within the FENV.	The School of Environmental Science will be formed Spring 2019 and will incorporate the Environmental Science undergraduate program and the Masters of Ecological Restoration professional graduate program.
Action 18: The Director will request that the Dean of Environment make funding available to hire a permanent lecturer to teach lower division EVSC courses. An appropriate home unit for the position (perhaps temporary, until a new governance model for Environmental Science is developed) will be decided in consultation with the Dean's Office.	Funds were provided for a limited-term lecturer beginning Summer 2016, who was appointed to ARCH through the Spring 2021 term. This LTL is responsible for teaching lower division EVSC courses.
Action 19: The Director will meet in 2016 with the FENV Dean to explore the feasibility of a cohort of tenure-stream faculty, that may include cross-appointments with partner units.	There is an ongoing search for a cross-appointed permanent lecturer with GEOG. Further appointments are necessary to make the present cohort program sustainable. Of the 11 courses taught in 2017-2018, only one was taught by a regular faculty member (above their expected teaching load). EVSC remains heavily dependent on sessionals and LTLs. The FENV Dean has requested and will continue to request approval for additional full time tenure stream positions from the Provost in faculty renewal plans.
Action 20: Given the emerging interest in collaboration expressed by members of the Department of Chemistry, the Director will meet with representatives in Chemistry to assess the feasibility of adding a Chemistry-themed EVSC concentration.	This meeting has yet to take place.

Environmental Science Program Assessment Plan Implementation

Prepared by Jeremy Venditti, Director of Environmental Science Program, November 9, 2018 for the mid-cycle review report.

The Environmental Science (EVSC) program faces two major challenges to program assessment. The first challenge stems from that nature of the EVSC program, which is an interdisciplinary science program made up of courses offered by other units in the Faculties of Environment and Science. Until Fall 2017, the program offered just 4 courses, two of which were one-credit upper division pass/fail seminars. This situation provided no formal venue to assess the program goals. In Fall 2017, a formal cohort set of courses were launched that allows EVSC to assess what students are learning in their discipline-specific coursework. The second problem is that there is not, and cannot, be any faculty appointed to the program. Historically, the program was administered from the FENV Dean's office, by a director, assisted by FENV advising and administrative staff. This model left few human resources for educational goals assessment. In Spring 2018, the program hired a manager who centralized all administrative and advising into one position, which provided some capacity for program-level assessment.

The 2015 EVSC External Review Response included a modest plan for assessment that has been followed. Below is a schedule of tasks to be completed, attached to each program-level goal (see attachment):

2015-2016

- Track Environmental Science student success in EVSC 100. (Goal 1)

This task was included so that EVSC could assess how many undergraduate majors were taking EVSC 100 and how they were performing in what is a popular breadth science course. This work started in Fall 2016. Tracking has revealed that there are only a few EVSC students in each of the 5-7 offering of the course each year. They do well in the course. EVSC students could benefit from a separate 100-level course designed for majors, but that would be logistically difficult without a faculty cohort in EVSC.

- Steering committee to define a list of characteristics for foundational knowledge in the disciplines that inform environmental science understanding. (Goal 1)

This was undertaken in Fall 2016. The list was used with syllabi for every course in the program to generate a curriculum map. Each course was classified as either: mention (1 class dedicated to an educational goal), focus (3-4 classes dedicated to a goal) or emphasis (majority of course dedicated to a goal). The map was used to streamline the program with most changes effective Fall 2017. Program changes to align with the educational goals is an ongoing process with revisions to individual concentrations (e.g. Applied Biology) in progress.

- Collect syllabi for all courses other than the EVSC courses. (Goal 1, 5 and 6)

This was undertaken in between Spring 2015 and Fall 2016 in preparation of the curriculum map.

- Create new EVSC courses to replace existing courses.

EVSC 201W: Environmental Science in Practice, EVSC 300: Environmental Science Seminar, EVSC 305: Methods in Environmental Science; EVSC 400: Environmental Science Capstone and EVSC 490: Environmental Science Thesis were created in Fall 2016. The new cohort program launched in Fall 2017.

- Track completion of REM 100, ENV 319, ENV 320 and ENV 321. (Goal 4).

The reason to track completion of REM 100 was so that EVSC could assess how many undergraduate majors were taking REM 100 and how they were performing. This has not been done because we lack the capacity for such analysis.

Completion of REM 319 (Environmental Law; formerly ENV 319), ENV 320 (Ethics and the Environment) and REM 321 (Ecological Economics; formerly ENV 321) was tracked for the period 2013-15. They are popular courses to complete the social science requirements for the EVSC program and fulfill Ed. Goal 4, according to the curriculum map.

2016-2017

- Map non-EVSC courses to goals 1, 5 and 6.

Completed in Fall 2016.

- Amend list of course options to remove external courses that aren't providing students with required knowledge.

This is an ongoing process. In 2016, we discovered there was a long list of social science and humanities courses listed in the program that had rarely been taken by the students to fulfill their social science requirements. While many of the courses addressed the educational goals, hidden prerequisites prevented students from taking most of the courses. Only REM 320W (84 enrolments), REM 321 (69 enr.), REM 319 (29 enr.), REM 356 (Institutional Arrangements for Sustainable Environmental Management; 42 enr.) and GEOG 389W (Nature and Society; 15 enr.) were taken regularly over that period. All other social science and humanities courses were removed from the program.

Revision of the Applied Biology concentration within EVSC will better align it with the educational goals. Once that is complete, other concentrations will be examined by the EVSC steering committee.

- Initiate program structure modification and addition of new courses into program.

Completed in Fall 2016.

- Begin tracking student completion of non-EVSC courses. (Goals 1, 5 and 6)

This has not been done systematically because we lack the capacity for such analysis.

2017-2018, 2018-2019, 2019-2020

There are no program-level assessment tasks scheduled for this period because there are no students to assess who have completed the new cohort program structure, which launched in Fall 2017. There seems little need to assess a program structure that no longer exists.

2020-2021

Future tasks include an assessment of Ed. Goals 2 and 3, after a cohort has completed EVSC 201W, EVSC 300 and EVSC 305, all of which are partly designed to teach and assess critical thinking and science communication skills. The other major task was to link assessment of the discipline-specific knowledge and proficiencies (Ed. Goals 5 and 6) in EVSC 400, the environmental science capstone course. Metrics and tools to assess this will be designed with the course instructor, who has yet to be hired, in consultation with the FENV educational consultant.

In addition to these tools originally envisioned, we will begin to undertake biennial student surveys to start after the formation of the School of Environmental Science and we will have the capacity to do so.

There are other assessment tools EVSC would like to use, but presently cannot. EVSC would like to track student completions and success at the course level. EVSC would also like to systematically track our graduates.

Consideration of the original Educational Goals Assessment Plan and the tasks that EVSC was able to implement leads to the following conclusions:

- 1) A standardized and centralized data reporting structure for student performance at the course level would be useful for educational goals assessment, especially for programs like the EVSC, which offer <20% of the courses included in the program.*
- 2) A systematic and university-wide tracking system for alumni should be implemented. There are no resources available for a program to do this, and that will not change when EVSC is moved to the new School of Environmental Science. We hope SFU University Advancement will implement a system that allows us to do this. There is no better assessment tool than the success of our graduates when they leave SFU.*

Educational Goals for EVSC

Compiled by steering committee in Fall 2014; revised Spring 2016

When students complete their Environmental Science degrees they will be able to demonstrate the following:

1. broad understanding of environmental science underpinned by a foundational knowledge of biological and physical sciences, mathematics and statistics
2. ability to critically evaluate scientific studies, interpret data, and synthesize information from multidisciplinary studies

3. effective oral, visual, and written communication, including scientific writing for scientific, government, industrial or general audiences
4. an understanding of social science perspectives on environmental issues, including i) environmental valuation and trade-off analysis, ii) key environmental policies, laws and institutions, and iii) environmental ethics.
5. discipline specific knowledge that focuses on
 - a. Applied Biology:
ways abiotic and biotic processes (both natural and anthropogenic) influence the dynamics of populations, the structure of communities and the function of ecosystems.
 - b. Environmental Earth Systems:
the atmosphere, biosphere, hydrosphere and geosphere, and how these interacting earth systems affect natural and human-modified environments.
 - c. Environmetrics:
statistical and quantitative knowledge as applied to environmental problems, design of monitoring programs for environmental data collection, and the theoretical justifications and implications of statistical decisions, with attention to law, ethics, and economy.
 - d. Water Science:
the fundamental processes affecting the cycling of water through Earth's systems, water use and consequences of use, water quality, and the role of water in the functioning and dynamics of aquatic ecosystems.
6. proficiency in
 - a. Applied Biology:
sampling and experimental design, quantitative methods of data analysis and interpretation (species classification, estimation of abundance, diversity of one or more taxa, geospatial analysis, population modeling, and multivariate statistical methods).
 - b. Environmental Earth Systems:
quantitative analysis of spatial and temporal dynamics in one or more of Earth's systems, or interactions among them, utilizing mathematical or statistical modeling, Geographic Information Systems, remote sensing and field/lab analyses.
 - c. Environmetrics:
statistical methods and model selection techniques within statistical software for the analysis of environmental data
 - d. Water Science:
quantitative methods of data analysis and interpretation in one or more (or interactions among) aspects of the Earth's water system, estimating uncertainty, measurement of water fluxes and use, and assessment of aquatic ecosystem health.