



**TO:** Mike Mahon  
President and Vice Chancellor

**DATE:** March 20, 2018

**FROM:** Alan Siaroff  
Chair, Academic Quality Assurance Committee

**RE:** Department of Biological Sciences Academic Quality Assurance Review

In accordance with the U of L *Academic Quality Assurance Policy and Process*, the Academic Quality Assurance Committee approved the review of the Department of Biological Sciences at its March 16, 2018 meeting.

The Self Study Committee for this review comprised Cameron Goater (Program Review Coordinator), Alice Hontela (Program Review Coordinator), Brent Selinger, and Helena Danyk.

The review produced four documents:<sup>1</sup>

1. *Self Study Report* (received October 20, 2017) – Self Study Report, developed by the Department of Biological Sciences Self Study Committee.
2. *External Review Team Report for the Department of Biological Sciences, Lethbridge University* (received January 9, 2018) – by Erica Nol (Trent University) and John Smol (Queen's University) based on their site visit of November 30 to December 1, 2017.
3. *Program Response* (received February 13, 2018) – response of the Self Study Committee to the external review.
4. *Dean's Response to Quality Assurance Review, Biological Sciences* (received March 12, 2018) – response to the review, written by Craig Cooper, Dean of the Faculty of Arts and Science.

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<sup>1</sup> All documents are available upon request.

## **Self Study**

The body of the Self Study Report contained the following program strengths:

- For the past four years undergraduate enrolments have risen 18%. The number of M.Sc. students in Biological Sciences has doubled over the last ten years.
- Between 2009 and 2010 enrolments in 3000-level courses rose 9%, likely from an increased number of course offerings at that level.
- Of the 17 faculty members, 15 hold NSERC Discovery grants, 10 hold research chairships, and four have won the Ingrid Speaker Medal for research excellence. In 2017, faculty members brought in about \$3M in research funding. Over the past six years, faculty have trained an average of 7.5 M.Sc. students per professor and 2.6 Ph.D. students.
- Over the past six years, the Department has published an average of 24 papers per faculty member.
- A unique Research Internship initiative is designed to attract and retain the best students.
- The biology major, and its satellite programs, are designed to recognize the complex, integrative nature of modern biology.
- Students have many opportunities to pursue specialized training.
- Students can design their own multidisciplinary major involving two Departments in the Faculty of Arts and Science.
- Biological Sciences majors can get intensive research experience in four main ways: (1) Independent Studies courses; (2) Applied Studies courses; (3) Honours Thesis option; and (4) Research Internship concentration.
- Students can complete up to six placements through the Faculty's cooperative education and internships programs.
- Every Fall, the Department designates a faculty member to act as the departmental academic advisor for that academic year.
- The Department collaborates closely with scientists at the Agriculture and Agri-Food Canada (AAFC) research station and with the Canadian Food Inspection Agency (CFIA). Students are encouraged to complete research projects at AAFC and CFIA.
- Students have opportunities for experiential learning in lab and field settings.
- Many areas of research strength in the Department are aligned with the Strategic Research Themes from the U of L Strategic Research Plan.
- Faculty members have a history of service on research-focused panels and committees, including the Alberta Conservation Association Grants, Alberta Scholarships, and Alberta Ingenuity Scholarships.
- According to Graduate Outcomes Surveys, responding students were "satisfied" or "very satisfied" with features like "quality of teaching" and "satisfaction with the program."
- 94% of students report full or part-time employment two years after graduation.
- All 17 professors in the Department are Ph.D. holders.
- The Department has 25 Adjunct faculty; they make a significant contribution to departmental activities.
- There is a Westcastle Field Station available to the Department.
- The Department's Herbarium includes over 22,000 specimens and a smaller teaching collection. All specimens have been digitized. The Herbarium is open to all individuals.

- The Department has a state-of-the-art Aquatic Research Facility in the Alberta Water and Environmental Science Building. This facility is equipped to investigate the effects of exposures of fish and other aquatic organisms to stressors.
- Faculty and instructors are engaged in outreach activities like Science Sizzle and Let's Talk Science.

The following challenges were noted in the Self Study:

- The curriculum is very complex as it includes several multidisciplinary majors. The structure of the Biological Sciences major is also convoluted, and can be daunting for students.
- The Biological Sciences major is restricted to 12 required biology courses.
- There is a limited diversity of course offerings at the second-year level.
- The Department's inability to replace retired or retiring faculty members has resulted in a decreasing capacity to sustain the curriculum effectively.
- There is an urgent need to hire new faculty.
- Regarding curricular changes, moving from conception to implementation is a challenge.
- The academic quality of new biology majors is perceived to be low. The entrance GPAs of incoming Biological Sciences majors are lower than those in other science Departments on campus.
- Senior courses in the biology major are a complicated mix of fundamental and specialized courses. It is possible for students to graduate without having received fundamental training.
- The number of students taking research-intensive Independent Studies courses has fallen.
- The number of Ph.D. students has declined by about a half since the peaks in 2011 and 2012.
- An average of 59% of biology majors that enter first year are retained into their fourth year.
- Library resources allocated to support Biological Sciences have been assigned completely to maintaining serial publications, resulting in neglect of the monographic collection.

### ***External Review***

Overall, the External Review Report said that the Department of Biological Sciences is well-run, collegial, and has a notable research presence.

Strengths:

- The Department is completely aligned with the U of L Strategic Plan.
- Courses are taught by full-time faculty.
- Almost all faculty hold tri-council research grants.
- Instructors are dedicated, knowledgeable, and enthusiastic.
- Adjunct faculty are a major strength, given the proximity of two major research facilities.
- Based on survey data, student satisfaction was overwhelmingly rated as "satisfied" or "very satisfied."

#### Challenges:

- Data show that many students move to other Departments after taking their first course in Biology. This may be part of the reason behind low student retention in Biological Sciences.
- Biological Sciences majors only need 12 courses to graduate, which is on the very low end of requirements for such a major across the country.
- The Department offers fewer courses compared to other biology departments in Canada.
- The teaching loads for full-time faculty who do not hold research chairs is slightly high.
- For labs, tensions may arise from the conflicting roles of overseeing the pedagogical aspects and ensuring continuity between lectures and laboratories.
- There are some concerns about disconnects between the lab and lecture components of courses.
- Retention rates are low.

#### Recommendations:

1. Double the course credit for undergraduate research thesis projects, to increase the research experience for undergraduate students.
2. Consider giving some teaching credit for faculty who are mentoring research projects.
3. Consider amalgamating aquatic courses and courses on gene expression and regulation.
4. When designating courses to be taught by new faculty, take into account the whole curriculum.
5. Areas for new hires should be chosen by the whole Department, with the aims of filling curriculum gaps, avoiding redundancies, and promoting research and teaching collaborations.
6. Schedule regular departmental meetings.
7. Offer a small number of courses online, including a second-year course in genetics and a third-year course in Ecology.
8. Move Biology 3300 (Evolution) to the second year. Offer a new course in biostatistics in the second year. Consider moving at least one course from list 1 to the second year.
9. Give faculty more credit for graduate student mentorship.
10. Consider team teaching to give flexibility to faculty members who have conferences or other research commitments.
11. Consider developing two specialization streams.
12. Look into increasing the number of courses needed for a Biological Sciences major.

The following additional recommendations were in the body of the report:

- The core of the biology degree should include: cell biology; molecular biology; genetics; evolution; ecology; and (possibly) biostatistics. The second year of the degree should include courses in genetics, ecology, and evolution.
- The Chair of the Department should assign teaching (and not the Associate Chair, as is current practice).
- Consider offering a research course at the third year level that is co-taught by two to four faculty. This could lend some efficiencies to better handle the large number of students taking Independent Studies or Research Internships.

The External Review Report concluded by responding to the items on which the Department asked for advice:

Area:	Response:
<i>Input on all aspects of the curriculum, but especially on how to move from ideas to implementation.</i>	Curricular changes can be made when everyone who has a stake in the changes has been informed and consulted. This can be achieved with a curriculum committee that reports to the Department chair and a departmental committee. The curriculum committee should meet monthly, before the departmental committee meets, and should provide monthly reports on proposed curricular changes. The changes are approved by the Department before going on to the other institutional approval steps.
<i>Advice on strategies to attract and retain stronger students for the major.</i>	Increase the number of required courses in Biology and give the ability to specialize in conservation biology, health, or molecular biology. Add one or two courses related to human health.
<i>How can senior course offerings be reworked to ensure students get fundamental training at appropriate times?</i>	The external review includes some suggestions for amalgamating existing courses and creating some new ones. Some senior courses are quite specialized and are more appropriate for graduate programs in molecular biology.
<i>How can the Department better balance faculty workloads so that the emphasis on undergraduate research is not eroded?</i>	Combine second and third year independent studies courses into a single research methods course. For this course, allow students to choose their own student paper topic. This course can be co-taught by a mixture of faculty each year, with some release from other teaching requirements. To boost interest in the research-intensive honours thesis program: (1) As above, combine second and third year courses into one research methods course. this gives less opportunity to do independent studies in early years of the program, which may increase interest in honours thesis. (2) Creating specializations may increase the number of students who take honours thesis. (3) Make the honours thesis course worth 2 full-year credits (12 credit hours).

## **Program Response**

In their Program Response, the Self Study Committee responded to specific comments in the external review:

<b>Comment from External Review:</b>	<b>Response:</b>
<i>Biological Sciences is a flagship Department.</i>	Faculty members have a general sense that the Department's commitment to high standards is producing increasingly strong students.
<i>The requirement for Biological Sciences majors to complete a minimum of 12 Biology courses is too low.</i>	Agreed. At the February 1, 2018 Department meeting, a motion was passed to increase the number of required Biology courses for the major.
<i>The curriculum should include more than two second-year courses.</i>	Agreed. At the February 1, 2018 Department meeting, a motion was passed to increase the number of second-year courses in the major.
<i>Develop concentrations.</i>	Agreed. At the February 1, 2018 Department meeting, a motion was passed to develop specializations in the major.
<i>Faculty course loads are too high.</i>	Agreed. Mentorship of high quality personnel must be considered in any revised strategy to address teaching load.
<i>It is not currently possible to increase the number of senior Biology courses.</i>	The Self Study Committee agrees that increasing the number of senior courses would be valuable for students. But this is presently untenable, given declining teaching capacity and rising student enrolments. The Department has begun discussions on various strategies to add more senior courses, including cross-listing.
<i>There are communication deficiencies in the Department.</i>	Agreed. The Department will work on various actions to boost communication, like monthly departmental meetings.

There are various other recommendations, including developing general courses and online courses, that the Department will investigate.

## Deans' Response

The Dean of Arts and Science, Craig Cooper, addressed recommendations put forth by the External Reviewers:

Recommendation from External Review:	Response:
<i>Double the undergraduate thesis course credit from two to four semester courses.</i>	This would need a university-wide discussion. However, the Department could require an Independent Studies course as a prerequisite for the honours thesis.
<i>Consider giving some teaching credit for faculty who are mentoring research projects.</i>	This is not possible in the current fiscal climate.
<i>Combine second and third year independent studies courses into a single research methods course. For this course, allow students to choose their own student paper topic.</i>	Agreed.
<i>Consider amalgamating aquatic courses and courses on gene expression and regulation. Create new upper-year courses.</i>	Agreed. If boosting the number of senior courses is not possible, the Department should revisit the "Partner Professor" relationship with the two research stations.
<i>When designating courses to be taught by new faculty, take into account the whole curriculum.</i>	Agreed.
<i>Schedule regular departmental meetings.</i>	Agreed.
<i>Offer a small number of courses online, including a second-year course in genetics and a third-year course in Ecology.</i>	Agreed.
<i>Offer some summer courses, such as the second-year course in Ecology.</i>	The Dean's office has taken some preliminary steps with Biological Sciences to offer summer courses. This should be explored further.
<i>Move Biology 3300 (Evolution) to the second year. Offer a new course in biostatistics in the second year. Consider moving at least one course from list 1 to the second year.</i>	Agreed.
<i>Give faculty more credit for graduate student mentorship.</i>	The Dean's office suspended the Supplementary Guidelines for Managing Assigned Duties in the Faculty of Arts and Science, which was introduced under different financial circumstances. The Guidelines took into account graduate supervision, but were unsustainable. With limited resources, it may not be possible to address this recommendation.
<i>Consider developing two specialization streams.</i>	Agreed.

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**Recommendation from External Review: Response:**

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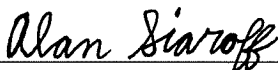
*Look into increasing the number of courses  
needed for a Biological Sciences major.*

A modest increase of from 12 to 14 courses could be easily  
achievable. Before making the increase, the Department  
should determine the average number of courses a student  
majoring in Biological Sciences has taken upon graduation.

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The Academic Quality Assurance Committee is satisfied that the Department of Biological Sciences  
academic quality assurance review has followed the U of L's academic quality assurance process  
appropriately, and acknowledges the successful completion of the review.

Sincerely,



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Alan Siaroff

Chair, Academic Quality Assurance Committee

Cc: Andrew Hakin, Provost and Vice President (Academic)