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MEMORANDUM

ATTENTION: Senate | TEL

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

RE: External Review of the Department of Biomedical Physiology and Kinesiology (SCUP 18-25)

DATE: October 17, 2018 | TIME

At its October 10, 2018 meeting, SCUP reviewed and approved the Action Plan for the Department of Biomedical Physiology and Kinesiology that resulted from its External Review.

The Educational Goals Assessment Plan was reviewed and is attached for the information of Senate.

**Motion:**

That Senate approve the Action Plan for the Department of Biomedical Physiology and Kinesiology that resulted from its External Review.

c: A. Brooks-Wilson
Paul Kench

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**MEMORANDUM**

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| **ATTENTION** | Peter Keller, Chair, SCUP | **DATE** | October 1, 2018 |
| **FROM** | Wade Parkhouse, Vice-Provost and Associate Vice-President, Academic | **PAGES** | 1/1 |
| **RE:** | Faculty of Science: External Review of the Department of Biomedical Physiology and Kinesiology | | |

Attached are the External Review Report and the Action Plan for the Department of Biomedical Physiology and Kinesiology. The Educational Goals Assessment Plan is included, for information only, with the Action Plan.

Excerpt from the External Review Report:
*"As an overall statement, the Review Committee found BPK to be an "engaged", high quality program with high quality faculty, staff and students."*

Following the site visit, the Report of the External Review Committee* for the Department of Biomedical Physiology and Kinesiology was submitted in April 2018. The Reviewers made a number of recommendations based on the Terms of Reference that were provided to them. Subsequently, a meeting was held with the Dean of the Faculty of Science, the Chair of the Department of Biomedical Physiology and Kinesiology and the Director of Academic Planning and Quality Assurance (VPA) to consider the recommendations. An Action Plan was prepared taking into consideration the discussion at the meeting and the External Review Report. The Action Plan has been endorsed by the Department and the Dean.

Motion:

**That SCUP approve and recommend to Senate the Action Plan for the Department of Biomedical Physiology and Kinesiology that resulted from its external review.**

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*External Review Team:
Alan Salmoni, Western University (Chair of External Review Committee)
Peter Backx, York University
Audrey Hicks, McMaster University
Wallace MacNaughton, University of Calgary
Nancy Forde (internal), Simon Fraser University

Attachments:
1. External Review Report (April 2018)
2. Department of Biomedical Physiology and Kinesiology Action Plan
3. Department of Biomedical Physiology and Kinesiology Educational Goals Assessment Plan

cc Paul Kench, Dean, Faculty of Science
Angela Brooks-Wilson, Chair, Department of Biomedical Physiology and Kinesiology

# Simon Fraser University
# Department of Biomedical Physiology and Kinesiology

## External Review Report

**Review Committee:**
Dr. Alan Salmoni, Western University
Dr. Peter Backx, York University
Dr. Audrey Hicks, McMaster University
Dr. Wallace MacNaughton, University of Calgary
Dr. Nancy Forde, Simon Fraser University

**External Review Committee 2018 – Terms of Reference**

The Review Committee was tasked to assess the Unit (BPK) and comment on its strengths and weaknesses, and on opportunities for improvement. The Review Committee was asked to make recommendations that address major challenges and opportunities.

Specifically, the review process was intended to ensure that:

**1.** The **quality of the Unit's programs** (graduate and undergraduate) is high and there are measures in place to ensure the evaluation and revision of the teaching programs. Some issues to consider include:

- degree requirements, structure, breadth, orientation and integration of the programs including the cooperative education program and the course offering schedule of the graduate programs;
- enrolment management issues, student progress and completion, and support for graduate students;
- educational goals that are clearly aligned with the curriculum and are assessable.

**2.** The **quality of faculty research** is high, and faculty collaboration and interaction provide a stimulating academic environment.

**3.** Unit **members participate in the administration** of the Unit. Some issues to consider include Unit size, adequacy and effectiveness of the administrative complement and facilities.

**4.** The **Unit's workplace environment is conducive to the attainment of their objectives,** including working relationships within the Unit, with other University units, the community and the Unit's alumni.

**5. Future plans** of the Unit are appropriate and manageable.

**6. Issues of specific interest** to the University and/or the Unit that the Review Committee should consider during the review were:

**6.1.** There is a perception among faculty that there has been continuous growth of undergraduate student numbers, but little net change in faculty and resources. Please provide input on how to optimize the use of our resources.

**6.2.** Do you agree with the proposed plans for hiring the next new research and teaching faculty (and their disciplines) into BPK?

**6.3.** What more, if anything, should our program be doing to prepare our KIN, BIF and BNEU Majors for future careers?

**6.4.** Please recommend any strategies to optimize/maximise research funding.

**6.5.** Do you see value in allowing students to enter the BPK graduate program through an accelerated BSc/MSc?

**Review Process**

- A site visit was conducted by the Review Committee from March 7th to March 9th, 2018
- During the visit the Review Committee met with the following:
    - Wade Parkhouse, Associate VP Academic,
    - Glynn Nicholls, Director, Academic Planning
    - Dugan O'Neil, Associate VP Research
    - Jeff Derksen, Dean, Graduate Studies
    - Claire Cupples, Dean, Faculty of Science
    - Bal Basi, Coordinator, UCIL
    - Angela Brooks-Wilson, Chair, BPK
    - BPK Research faculty
    - BPK Teaching faculty
    - BPK Undergraduate Program Committee Chair, Richard Ward
    - BPK Graduate Program Committee Chair, Tom Clayton
    - BPK staff
    - Co-op education administrators – D. Bemister (BPK) & S. Tonsaker (SFU)
    - BPK Undergrad students
    - BPK Graduate students

- Prior to the site visit the Review Committee was provided with documentation describing both the internal and external context for the review. Documents included:
    - Terms of Reference (see above) for the external review
    - BPK Self Study Report with appendices
    - Data on SFU Research Grants and Contracts to Academic Departments
    - Faculty of Science Five-Year Plan (2013-2018)
    - BPK faculty CVs
    - SFU Senate Guidelines for External Reviews
    - SFU Strategic Vision
    - SFU Five-Year Academic Plan (2013-2018)
    - SFU Strategic Research Plan (2016-2020)
    - Institutional Accountability Plan and Report (2016-2017)
    - Senior Administrative and Senior Academic Structure Charts

- Following the site visit the Review Committee was asked to file a summary of its detailed findings within 6 weeks of the visit (found below).

**Context for the Review and Report**

SFU's Strategic Vision is... "to be the leading engaged university defined by its dynamic integration of innovative education, cutting edge research and far-reaching community engagement".

Specific goals include:

- Engaging students [to equip SFU students with the knowledge skills, and experiences that prepare them for life in an ever-changing and challenging world]
- Engaging research [to be a world leader in knowledge mobilization building on a strong foundation of fundamental research]
- Engaging communities [to be Canada's most community-engaged research university]

SFU also in its Strategic Vision commits to several underlying principles.

- Academic and intellectual freedom
- Diversity
- Internationalization
- Respect for Aboriginal peoples and cultures
- Supportive and healthy work environment
- Sustainability

Not surprisingly, the BPK Self Study follows closely from and adheres to these goals and principles. Also not surprisingly, the Self Study finds its place in the Faculty of Science five-year academic plan (2013-2018) and importantly SFU's Strategic Research Plan (2016-2020). Of note for the Review Committee was how well the Department of Biomedical Physiology and Kinesiology (BPK) seems to not only embrace SFU's vision and goals, but indeed could be seen as a campus leader in SFU's Mission. As an overall statement, the Review Committee found BPK to be an "engaged", high quality program with high quality faculty, staff and students.

An important contextual factor present in several documents was SFU's statement that the next few years will likely be a period of "consolidation rather than growth" (p.1 of Five Year Academic Plan of the Vice President Academic). Tables 7, 8, and 9 (p.33) of the SFU Institutional Accountability Plan and Report suggest that revenue generated by domestic undergraduate and graduate students has leveled off. As in other institutions in Canada, international students have been recruited to offset at least some of this funding shortfall (see Table 6, p.31). *A conservative approach to "growth" is taken in the Review Committee's recommendations reported below.*

Another important contextual factor is the realization that, despite the federal government's recent budget commitment to fundamental science research, Tri-Council funding will likely become more competitive and perhaps less reliable as a source of consistent research funding (see Figure 2, p. 35 of the SFU Institutional Accountability Plan and Report). Therefore, in spite of the fact that the researchers in the entire Faculty of Science including BPK have been impressively successful in obtaining research grant funding compared to the rest of the University (see Table 1, p.3 of the Faculty of Science Academic Plan 2013-2018), the challenge for research funding will likely increase. An area of growth for research funding would seem to be industry sponsored research (see Figure 2, p. 35 of the Institutional Accountability document). *Critically important to what the Review Committee recommends below is the*

*fact that the Committee learned during their meeting with Dr. O'Neil (AVPR) that SFU has a large number of unused CRC positions available and would like to have them occupied.*

Of particular relevance to BPK is the rise in student numbers (AFTE's) over the past decade with a smaller change in faculty complement (CFL), as validated in Graph 1 and Graph 2 of the Faculty of Science 5-year academic plan 2013-2018 (see also Figure 1 and 2 of the BPK Self Study). This means that BPK has a relatively high student to faculty ratio. The Review Committee notes that this trend is likely not specific to BPK at SFU, but indeed reflects the high popularity of Kinesiology programs across Canada. *Importantly, BPK has recently made adjustments that have allowed BPK research faculty to have teaching loads commensurate with the rest of the Faculty of Science*.

Also related to student numbers, it is important to note that BPK has had a rather consistent number of graduate students over the past 5-7 years (see Figure 14, p.33 of the BPK Self Study). Recently there has been a strategic increase in doctoral students with an offsetting decrease in master's level students. The BPK Self Study reports that the research faculty supervise, on average, 2-3 graduate students each. Whereas this number likely varies somewhat across research faculty, this supervisor to grad student ratio seems reasonable (*and was seen to be reasonable by SFU's Dean of Graduate Studies*).

**Specific Detailed Comments as it relates to the Review Committee's Terms of Reference**

The numbers used below refer to the numbers in the Terms of Reference for the review process (see p.1-2 above). Writing in red indicates specific Review Committee recommendations.

## 1.0 Quality of the BPK Unit's Programs

### Undergraduate Program

BPK has three degree programs supporting 3 distinct undergraduate majors, KIN (Kinesiology), Biomedical Physiology (BIF), and Behavioural Neuroscience (BNEU). *This grouping is not only very unique to Canada, but shows a high degree of innovation on the part of BPK*. This also signals a good degree of co-operation among Departments/Faculties at SFU. While many of the core courses are shared across the three programs, there are specialized courses as well. BNEU is most innovative as the degree core program is jointly supported by BPK and Psychology. The implementation of the BNEU program, by necessity, resulted in at least one new faculty position in BPK.

The requirements, structure, breadth and orientation of all three programs seems largely appropriate and of high quality. Evidence of this is the fact that the KIN and BIF degree programs are accredited by CCUPEKA and ACDP respectively. The Review Committee is not aware of a similar accreditation in Neuroscience. All three programs meet SFU's structure and breadth requirements as well.

The Review Committee noted that enrollment management and degree completion time are significant challenges in BPK. A significant issue is the fact that the department has little to no control over the direct entry students enrolling from secondary school into BPK. This is challenging because there is no certainty on student numbers from year to year (numbers have gone up significantly over the past several years), making long-term course scheduling and planning difficult. The Review Committee recommends that the entrance average from secondary school be similar to that of Kinesiology at UBC, a prime competitor for undergrad students entering from high school. BPK obviously does not want to

be viewed as a second-class program. The Review Committee understands that this will raise the required entrance GPA above that of other departments in the Faculty of Science, as it was reported that UBC's entrance average is approximately 90%. However, it should be noted that UBC's entrance average is commensurate with Kinesiology programs in Ontario. There is also a perception that many of the current entering high school students are not of high academic quality. To the degree that this is true, the Review Committee recommends that the continuation GPA be relatively high to ensure that only high-quality students progress to second year. On a regular basis BPK has allowed a significant number of students to enter the programs as internal transfers. BPK views this as a means to ensure high quality students in the program as these internal transfers have a proven university performance record. The process has validity. The Review Committee recommends, however, that BPK take strategic control of the number of internal transfers within the Faculty of Science, as 100 internal transfers per year (a statistic provided to the Committee during its meetings) seems too high given the lack of control for direct entrants from secondary school. An unusually high secondary direct entry number could be offset by a lowering of the number of internal transfers. Whereas there was some resistance to this latter idea in our meetings, the Review Committee thinks a *pragmatic approach* to student numbers is warranted, particularly in light of the relatively large class sizes in many lower level courses and the frequent comments made about "high" teaching loads by BPK faculty.

The Review Committee did not spend a significant amount of time discussing the educational goals as they align with the curriculum, except to note they are a work in progress and highly relevant to the future of the programs. There was some discussion of a curriculum mapping process that is also ongoing to ensure that progression through the program follows a logical course and that there is not undue redundancy within courses. For example, in the meeting with the undergrad students they mentioned that much attention is paid to ion channels in several courses, due to the overlapping interests of research faculty running these courses. The Review Committee also heard that some upper level electives are very specialized (e.g., an entire course on ECG). The Review Committee heard from faculty that there is a need for "capstone" courses at the end of a student's program. All these comments are important and valid considerations. To deal with these and all related curricular issues, the Review Committee strongly recommends that the educational goals and mapping exercises be accelerated with a completion date of early 2019. The Committee appreciated the section in the Self Study that deals with teaching innovation (pp.39-41) and the close ties with SFU's teaching support (Dr. Cindy Xin). Also appreciated was the idea of the "Teaching Circle" to continue the dialogue amongst professors as it relates to teaching innovation. *This dialogue is particularly important for new faculty hires*. There is, however, no evidence that there has been an attempt to strategically infuse these practices. It is obvious that the content of the courses as well as the teaching process are important. Critical thinking was mentioned frequently, but it was surprising to the Review Committee that there was little mention of teaching innovative/creative thinking. Many real-world problems require significant innovative thinking for solutions. If universities are to produce tomorrow's leaders as most claim, then creating innovative/creative thinkers seems essential. Dr. Finegood's involvement in the Semester for Dialogue program at the downtown campus begins to address this issue. However, the Review Committee recommends that infusing creative/innovative thinking more broadly into the educational goals be considered critically important during the educational goal setting process.

Obviously, because of its position in the Faculty of Science, the BPK programs have a considerable number of base-level "science" courses. Whereas this may be ideal, it may be practical to consider whether this number can be scaled back. There was acceptance of this idea by the undergrad students we interviewed, but push back from some faculty when we suggested reducing the Calculus content, for example. One reason to consider some flexibility here is the fact that Anatomy is a third-year course in

the KIN program, whereas in many Kinesiology programs this offering occurs as a lower level course. The Review Committee recommends moving Anatomy to second year, as anatomy is conceptually necessary in many upper level BPK courses. It is also common practice in other kinesiology programs to count anatomy as a "science" course. Reducing the number of base level science courses may make additional space for upper level electives in and outside of BPK. Many kinesiology programs in Canada feel a good number of open electives is educationally critical. The Review Committee recommends that serious attention be paid to scaling back some of the program requirements, thus adding more flexibility for open electives. Pragmatically this would provide reduced student pressure on upper level BPK electives. This move would also help with upper level course scheduling, a significant challenge mentioned by the undergrad students interviewed.

Several faculty (research and teaching) expressed the desire for undergraduates to gain more "hands-on" experience in research labs, and an increase in "experiential learning" overall. While the Review Committee agrees with this, particularly as it relates to future grad student recruitment and increased employment options post-graduation, it is understood that available places in research labs and supervisor time may be limiting. Nevertheless, the Review Committee recommends that the Department explore ways to increase undergraduate opportunities to gain lab-based research experience. The accelerated bachelors program may be a vehicle to do this.

The Review Committee also identified challenges confronting undergraduate students in navigating and ensuring course availability. In fact, it seems likely that the long time to graduation in the undergraduate program can be traced, at least in part, to difficulties in the enrollment into either core required courses or courses that students wished to take.

Co-op Program

While producing many curricular challenges for the department and the students, the Co-op program is clearly a strength of BPK with 52% of the students electing to participate. This experience provides students with a significant educational addition to their classroom experiences plus valuable job experience and career direction. The fact that students can elect this experience in any semester is a wonderful opportunity and a huge challenge for all stakeholders. For example, the academic advisor often has a feeling of being overwhelmed with student inquiries (see strong recommendation below). Most significantly, the successful Co-op program in BPK necessitates the offering of core courses during all three semesters, particularly in KIN. Because BPK leads SFU in co-operative student experiences it likely also explains why BPK has a high ratio of teaching to research faculty and the departmental "enthusiasm" for Centre for Online and Distance Education (CODE) courses.

In our discussion with D. Bemister and S. Tonsaker, the Review Committee learned that the Co-op placements for KIN majors are thriving/exemplary, whereas the BIF placements need concerted effort to match the KIN success (It was noted that the KIN Co-op has been in place considerably longer than for the other two degree programs). Work to identify BIF and BNEU placements is underway and was noted to be very challenging by D. Bemister. The Review Committee also learned that some faculty believe the community-based Co-op placements can produce important research opportunities for students and research faculty. Given SFU's mission to be a research-intensive, community-engaged institution, this observation seems critical. The Review Committee suggests that the search for new and innovative Co-op placements could/should be viewed as a creative process to identify unique research opportunities, but also a means to identify new, never-before-thought-of jobs/careers for BPK students and graduates. Lululemon and Forteus, as well as hospitals in the region, were examples mentioned by research faculty.

The Review Committee supports the request to make the 0.5 Co-op Career Advisor a full-time position. The request seems entirely consistent with student need and government pressure on post-secondary institutions in Canada to be "career relevant".

Graduate Program

As supported by our discussion with Jeff Derksen, Dean of Graduate Studies and our own audit of the graduate program in BPK, as well as a visit to two research labs, our overall assessment is that the graduate program is of high quality. Both the MSc and PhD seem well conceptualized and run with excellent research facilities. Of particular note, was the significant success of BPK graduate students in obtaining scholarships (data supplied by the Dean of Graduate Studies). This success is to be commended.

There were, however, some important issues and opportunities uncovered during discussions with stakeholders. Perhaps spawned by the lengthy time to completion in the undergrad program, the time to completion in the MSc program was judged by the Review Committee to be excessive (8 semesters on average is too long, 6 on average being optimal). The time to completion seems to be driven by BPK supervisor expectations and extended funding by them beyond 6 semesters. The Review Committee suggests BPK discuss this issue, led by the Graduate Program Committee Chair to consider ways to shorten this time line. For example, we learned in our interview with the BPK graduate students that some MSc students complete as many as three research studies during their MSc thesis work. This seems excessive. It is noted that this number may change with the accelerated MSc/PhD.
Some discussion centered around graduate course offerings as a workload challenge and a professor involvement issue. The BPK Self Study (p. 36) presents the possibility of developing modularized graduate courses. In our discussion, the Committee learned from Nancy Forde that the Physics Department at SFU is considering the same thing and indeed has proposed developing 1-credit modules. This strategy seems to have much merit and indeed may have merit across the Faculty of Science at SFU. One-credit modules across the Faculty of Science would allow for a tailoring of a graduate student's courses to their individual needs, add educational flexibility, and potentially reduce course burden in any one department, while giving each research faculty an opportunity to be involved in teaching graduate courses. The Review Committee strongly recommends that this idea be aggressively explored, perhaps initially with discussions between BPK and Physics.

Supervision issues consumed most of the Review Committee's two interviews with BPK graduate students, as this was seen as a pressing issue by them and definitely generated a good degree of emotion during the discussions. Three issues were most prominent. First, many graduate students reported working well beyond the suggested hours a week in their TA assignments, even though a maximum commitment is mandated in the graduate student collective agreement. The second issue identified by the graduate students was the supervisor-student working relationship. Whereas most supervisor-student relations are working well, some have fallen off the rail with no remediation seen to be open to the students. Several students seem to be remiss in having an annual supervisory committee meeting, and some reported distinct difficulties in having regular contact/interaction with their supervisor. Third was the low level of financial support, relative to the high cost of living in Vancouver. The Review Committee makes three strong recommendations to address these issues.

- The TA hours of work in any one term must honour the collective agreement, and these hours need to be tracked by the Department Chair. This is a workload issue for the graduate students (potentially affecting time to completion) and the department.

- A comprehensive contract between the supervisor and graduate student must be developed/improved (the committee learned from the Grad Program Chair that a contract exists, but was unknown to the 7 graduate students interviewed, and its use was not enforced by the Department). The contract must outline student and supervisor expectations and responsibilities including funding for students. Most importantly, the contract process must be monitored carefully by the department, particularly in the early stages of a student-supervisor relationship, and should be revisited annually by the student and supervisor. In addition to the contract, an official milestone strategy would facilitate time to completion of requirements such as thesis proposals.
- The University and BPK must increase their financial support of graduate students to remain competitive, to limit the need for students to seek outside employment opportunities in order to pay their bills, and to attract the best graduate students internally and externally.

Mentoring of young inexperienced supervisors could undoubtedly play a significant role in the BPK graduate program. If not already in place, the Review Committee recommends that a supervisor mentoring program be standardized for new research faculty appointments. The department may want to refer to a recent article in University Affairs about graduate student supervision (www.universityaffairs.ca/April2018, page 48). Of relevance may be the suggestions about departmental discussions of such issues and the training program for supervisors developed at Memorial.

## 2.0 Quality of Faculty Members Research

As judged by the Review Committee and supported by AVP-R, Dugan O'Neil, the quality and quantity of BPK publications and grants is high. Data received from Dugan O'Neil places BPK third among Faculty of Science departments in Tri-Council funding from 2011-2017. *BPK is to be commended for such strong performance in the face of declining national success rates in Tri-Council competitions*. Almost all research faculty (20 of 23 listed in the Unit Biographies in the Appendix) are well or relatively well funded. Only 3 research faculty are presently unfunded. The SFU data also suggest that this strong performance has been sustained for some time. A significant dip in grant funding seen in the 2012 to 2013 period (see Fig. 4 and 10 in the Self Study document) was suggested to be the result of the cessation of one researcher's very sizable non-profit supported grant. Otherwise, the funding has been relatively consistent with the possible exception of more recent CIHR funding. The number of publications shows (Fig. 12 in the Self Study) steady increase over time as well. A perusal of journals within the publications outlined in the Appendix to the Self Study also suggest good quality/impact. *The obvious question is how to maintain or expand this productivity*.

In discussions with research faculty in BPK the Review Committee learned that the collaborative efforts inside and outside of the department are strong, including collaboration beyond SFU (see also pages 42 and 43 of the Self Study). This strong collaboration includes both younger and older, established researchers in BPK.

While the research clusters described on pages 21-22 in the BPK Self Study appear conceptually appropriate for the research faculty and SFU's strategic research areas, leadership of these groups was less obvious. Explicit leadership in these groups would ensure cross pollination within and across the five clusters as well as outside the unit. Many/most research teams organically evolve but stimulating opportunities including leading team grants and providing an internal climate for collaboration is helpful. Spawning relationships across campus and into the community benefit from the mentoring and experience of established researchers. For example, Glen Tibbits seemed to us to be a leader in the

Cardiovascular Physiology Group and he outlined exciting initiatives that would expand collaborations and research opportunities thereby making BPK a centre for innovative and impactful research. Other less senior BPK faculty also have exciting research programs that could be strengthened by providing opportunities for leadership development and expanding funding opportunities. The Review Committee recommends that a leader of these groups be formalized, perhaps forming an ad hoc committee whose role would be to spawn cross pollination and strategic cooperation within and across clusters and beyond.

A significant concern voiced by some research faculty was the apparent disconnect in communication links from upper management down to the department and individual researchers level. When meeting with Dugan O'Neil, the Review Committee learned of the significant number of unfilled CRC positions, SFU Innovates, and the Community Trust Endowment Fund. When the Review Committee shared this information with research faculty in BPK the reaction was, "this is news to us". It is obvious for the Review Committee to suggest improving communication amongst important research stakeholders at SFU. On a positive note, Dugan O'Neil identified several initiatives to address this issue and to ensure all researchers are able to take advantage of SFU seeding opportunities. These initiatives combined with strengthening leadership are seen as imperative for the growth and impact of research activities within and beyond BPK.

On a related note, faculty researchers remarked on the extensive support for CFI proposals and implementation of successful applications, including great support from the Dean of the Faculty of Science. All of this was sincerely appreciated. There was some disagreement among research faculty as to whether other research support was optimal. Strategic support of young/first-time grant applicants was acknowledged by the Dean and BPK researchers. If possible, further support beyond that described above would also be appreciated. One research faculty, for example, would appreciate help finding appropriate funding opportunities. This also seems likely to be improved by the AVP-R initiatives discussed. For example, the Committee learned from Dugan O'Neil of the new technology/industry services being planned, well beyond the existing support (e.g., patent application).

An oft-mentioned comment from research faculty was the fact that departmental meetings are dominated by discussions around undergraduate teaching. One research faculty member suggested that, as it relates to departmental meetings, grad studies and research are treated as "add-ons". This sentiment was relayed to the Department Chair. The Review Committee recommends that this bias at departmental meetings be curbed by starting many meetings discussing research initiatives and issues related to the graduate program. Perhaps a report on new initiatives and opportunities by the leaders of the research clusters described above would be a good fixture in the meetings.

As many administrators and the Review Committee noted, a "bums-in-seats" tone was noted in the Self Study. We were informed that the instructions for the Self Study directed that a financial argument must be provided for any new resources (thus the bums-in-seats tone). This tone was problematic because SFU Administration, including the Dean, indicated to the Review Committee that a strong research-based rationale was more important or equally important when arguing for new research faculty hires. The Review Committee learned that the VP-A was responsible for hiring decisions. The Review Committee felt that it would be helpful if the VP-A and VP-R coordinate their messaging, particularly since it seemed to the Committee that the best argument for research faculty was facilitation of BPK's and SFU's research mandate, including CRC chairs. Requests for CRC chairs would be a good example of the "tone" suggested for new research faculty hires. This commentary is revisited below under new faculty hires.

Current research facilities were noted to be adequate presently. Future growth will likely outstrip present research space. However, a new Life Sciences building was mentioned by the AVP-R as the number one SFU building priority. Clearly this will be a significant opportunity for BPK research infrastructure.

## 3.0 Unit Members Participation in the Administration of the Unit

The primary governance of the unit is directed by several committees mandated in the Department's constitution:

- Committee of the Whole
- Undergraduate Program Committee (UPC)
- Graduate Program Committee (GPC)
- Tenure and Promotion Committee

Two other ad hoc committees are also listed:

- Search committee for Staff
- Search committee for Faculty

The primary administrators are the Chair of the Department as well as Chairs of the Undergraduate and Graduate Program Committees.

Whereas the Committee of the Whole is comprised of most members in the department, the other committees have smaller sizes/representation. These committees have adequate student representation and voting privileges. A perusal of the departmental biographies in the Appendix suggests that most faculty serve on at least one committee either within the department or within the Faculty of Science or University at large (e.g., animal care, grant review panels like CIHR). Several faculty play significant roles on university-wide committees. Very important to note is the fact that several faculty members serve on Tri-Council (e.g., CIHR) and other major funding agency (e.g., Heart and Stroke Foundation) scientific review committees. While noteworthy, it is important to continue this latter participation if BPK wants to be seen as active partners in the research mission of these agencies, and to maintain a presence at the national level. Understandably the participation of staff on unit committees is less than that of the research and teaching faculty, but there is no doubt that staff play an integral role in the management of the department and are well respected for doing so.

A critical aspect of the administration of the department are the faculty members who agree to take on administrative roles within the department (e.g., Chair). The Self Study document mentions specifically "succession planning" for administrators like the Chair (see page 8 of the Self Study). The Review Committee strongly encourages this succession planning to continue as it is critical to the life of BPK. Explicitly targeting associate and assistant positions to mentor new administrators for the future ensures continuity of governance, but also ensures that new hires do not have to be used to hire administrators. If an internal appointment strategy is to be used, it will be critical to ensure administrators are given the opportunity to maintain at least a minimal research program while being an administrator. The Review Committee suggests that team grant participation in the identified research clusters is a vehicle for this strategy of ensuring that faculty taking on significant administrative roles stay active in research. This approach will also ensure that department leaders have active research programs to return to once their administrative appointments expire. Three-year terms for chairs appears reasonable in the above model.

Overall, the review panel felt that there are really no issues here, as BPK appears to be very efficiently run and morale and collegiality appears strong (e.g., there were no issues raised and much praise offered for departmental co-workers).

## 4.0 Unit's Workplace Environment

The workplace environment appears to be quite positive based on the fact that teaching evaluations are strong and research productivity is high, relative to other units in the Faculty of Science and other units in the University. In a recent survey (see Self Study pp. 57-58) 90% of faculty and staff reported the workplace to be collegial and 86% reported the atmosphere has improved compared to five years ago. There is a high degree of trust and confidence amongst faculty and staff and this certainly came across in our departmental interviews.

A slightly more restrained interpretation of the data seems warranted when considering some of the other comments from the survey. There is an indication of very committed and passionate faculty and staff (p.56, first paragraph, "indeed, BPK committee work is the subject of considerable passion") and the Review Committee sensed this passion on more than one occasion. This suggests significant physical and emotional energy are being interjected into the Unit's mission and this is to be very highly commended. The caveat to this enthusiasm is the fact that this same commitment can also lead to burnout, as suggested in the Self Study document (see the bottom of p.57 and the top of p.58 that address workload, life balance, and burn out). In this section it was reported that, "46% don't feel they can reasonably balance the demands of work and personal life and 53.9% feel they don't have energy left at the end of most workdays for their personal life".

A good example of the contrasting views is the section in the Self Study that reviews the wonderful work on "Internal and External Alliances/Partnerships/Collaborations and Internationalization" (pp42-43). BPK faculty and staff are to be highly commended for their work here. In contrast, however, is the likelihood that the more successful this enterprise is, the more effort that is expected. Indeed, excessive work becomes normative. For example, whereas these alliances are essential to the research, teaching and innovation mission of the unit, the development and maintenance of alliances is undoubtedly stressful and energy demanding. In short, an "engaged university" has its down side, particularly for committed and passionate faculty, staff and students.

Some degree of this stress is undoubtedly "self-inflicted". We heard from many instructors that the increase in class sizes has significantly increased their workload (and/or that of TAs) due to the time needed to grade written assignments/papers/exams. When questioned whether there was room to maybe limit the number of written assignments in these large classes we were often given the answer that this would negatively affect the quality of the class. In these situations, to preserve work/life balance perhaps pragmatism might need to outweigh idealism. Life balance is certainly something addressed in BPK courses in health and to a significant degree this is a self-management issue. On the other hand, the Unit and particularly the Chair must set a tone/culture that makes life balance a priority for faculty and staff (and students) and balance is expected to be normative behaviour. It can easily be argued that BPK employees should be (life balance) role models for the university at large and BPK students in particular. Since many BPK graduates will also be intimately involved in the same challenges for clients they need to imitate healthy practices and learn to be role models themselves. The Review Committee recommends that an ad hoc committee be struck that studies these burnout and life balance issues and makes recommendations on effective countermeasures.

The Review Committee recognizes and applauds the BPK Mental Health and Wellness Committee and its work, particularly as it relates to undergraduate and graduate students. As reported in every university in North America, the undergraduate and graduate students in BPK vocalized a significant degree of stress and anxiety. The Review Committee strongly recommends this committee continue its work and that the department discuss ways to infuse proactive sound mental health strategies into its curriculum. Talking about mental and physical health and participating in active, balanced living is essential.

## 5.0 Future Plans

The Review Committee found the future plans to be generally logical and valid. Some of the plans were, however, somewhat abstract in their description. In our review of the self-help document sent to departments to guide a departmental self study, it appeared that BPK had followed the guidelines. It was surprising that there was no explicit (roughly process and outcome) evaluations added to the BPK plans (nor could this suggested format be found in the self-help document). The Review Committee suggests that consideration be given to the inclusion of plan evaluation be added to the self-help guide. Tracking success of plans seems obviously critical to their accomplishment.

BPK Long-Term Goal 1: To systematically collect data from BPK Alumni at multiple time points to track their career paths and analyze and interpret the data to inform curricular scope.

The Review Committee learned that the Alumni office at SFU is not extensive and likely could not provide much support for the proposed work. It was also noted in our discussions that many of the Co-op placements are with BPK alumni. In light of this fact, the Review Committee does not recommend allotment of resources (time and money) to the tracking of BPK alumni (proposal found on page 54 of the BPK Self Study). This exercise will undoubtedly be very time consuming and not likely successful. Instead, we recommend that the department work closely with D. Bemister and S. Tonsaker to harvest similar information from co-op worksites. These sites can obviously identify (and likely has) job and career preparation shortcomings, as well as future opportunities. It is also recommended that the Chair of BPK sponsor regular meetings between Co-op staff and BPK faculty/staff (e.g., twice per year) to discuss opportunities, information collecting strategies, and other symbiotic initiatives. To further inform curricular decisions (and to capture those students that do not elect to do co-op) it is also recommended that the Department initiate an annual exit survey of their graduates.

BPK Long-Term Goal 2: Maintain and build research strength in human health across the lifespan.

A weakness of the description in the Self Study on page 46 in this area appears to be in its conceptualization. Lifespan health is clearly not just people studying health of different age groups from children to older adults. Challenge 3 in SFU's Strategic Research Plan 2016-2020 appears to take a developmental approach, particularly as it relates to prevention. It is noted that, although four of the five clusters described in the BPK Self Study are connected to aging, a "lifespan approach" is not explicitly mentioned in the clusters. The Review Committee feels that addressing lifespan health successfully would require significant new hires. Directed recruitment in this area would require a significant (likely unfeasible) commitment of resources in order to achieve the critical mass necessary to ensure success and impact in this area. Developing expertise in "lifespan health" is more likely to be achieved through collaborations or adjunct and cross appointments of researchers from other units.

BPK Long-Term Goal 3: Continue to build our considerable research strength in the area of technology and innovation.

There is no question this is an important direction to take given the existing momentum and given SFU's Strategic Research Plan 2016-2020 (Research Cluster 2). This area may be ideal for a Tier 1 or 2 CRC appointment to BPK or to another department in the Faculty of Science with a cross appointment to BPK. Professors Max Donelan and Andy Hoffer can play leadership roles in this initiative, as can others noted on page 23-24 in the BPK Self Study.

Since this initiative aligns with SFU's Research Cluster 2, there are undoubtedly many researchers in many departments with expertise in this area. The Review Committee therefore suggests that a research leader in BPK be appointed to explore relationships across SFU to build capacity. Clearly research synergies on and off campus are SFU's long-term goal.

BPK Long-Term Goal 4: Strengthening existing areas of interdisciplinary research excellence by increasing the use of SFU resources such as those related to Big Data.

In discussions with research faculty, it seemed clear that interdisciplinary research is occurring within research clusters and through the collaborations that BPK researchers have established within and outside SFU. Most interdisciplinary studies are centered around complex conceptual issues or real-world problems. Department members are encouraged to continue to seek and solidify these relationships and to seek out the platforms being developed at SFU (and beyond). For example, interdisciplinary research seems comfortably housed in a Big Data framework. The question is whether future recruitment of research faculty should target scientists that have expertise in analyzing big data or expertise in neuroscience or health device innovation, etc.

BPK Long-term Goal 5: Continue to build engagement with community partners.

This goal seems reasonable for an "engaged university", the nature of the BPK academic program, the BPK co-op program, and the externally driven research engagement. The Review Committee agrees there is considerable departmental momentum in this area. The Co-op program and the community-centered research seem natural vehicles for continued evolution. The Department is encouraged to work closely with the Office of Advancement to identify areas for community engagement and philanthropy to help develop projects, programs and platforms in the future.

## 6.0 Issues of Specific Interest

### 6.1 Unit Growth over the Past Decade

As mentioned above, the Self Study document presented a tone of bums-in-seats to justify new hires. Whereas the growth in student numbers is clear, the Dean of Science feels strongly that BPK, relative the other departments in the Faculty, has benefitted significantly from new hires in the past 7 years. The terms of reference for the review asked the Review Committee to provide input on how to optimize current resources. As reported above, the Review Committee has made several recommendations to control student growth and to gain curricular efficiencies. The Review Committee feels a pragmatic approach to student entry and course offerings can significantly alleviate some workload issues. In addition, the Review Committee discussed with some faculty members the idea of designing

pedagogical strategies to reduce faculty, and perhaps TA, workload. The Review Committee recommends the creation of an ad hoc committee to discuss and make recommendations on methods to optimize teaching strategies and pedagogical methods. Collaboration with Dr. Cindy Xin is an obvious suggestion.

6.2 Future Hires

The Review Committee categorically endorses the replacement hires for retiring/exiting BPK lecturers. The undergraduate teaching mandate of BPK cannot be maintained without this sustained support. The lecturers are in many ways the life blood of the BPK undergrad program and viewed by the Review Committee as a huge asset. Whereas the Review Committee is less clear on the optimal ratio of lecturers to research faculty, the current number of lectures seems to be working well. The Review Committee sensed a significant amount of enthusiasm from this group when we met and also learned that many of them fill a research role in addition to their teaching. Indeed, some lectures have been named investigators on research grants and/or publications.

To not place the next suggestion at the bottom of this list, the Review Committee strongly recommends the hire of a second full-time academic advisor. Both the undergrads and the current academic advisor we met with affirmed that this was an urgent need. The Review Committee notes the complexities of the course scheduling around the Co-op program as a major impediment to yearly student planning and may be at least partially responsible for the slow undergraduate time to completion. Face to face meetings are the only effective ways to solve these complexities for many students. An additional person in that office will also free up some time to develop some online resources for students to assist them with their academic planning (e.g. program progression maps).

Whereas the Review Committee endorses the hiring of at least one new research faculty (and certainly replacements of future retirees) this is a more difficult aspect to comment on. We agree with the Department that the hiring a new exercise physiologist was highly desirable, particularly as it might bridge the physiology and kinesiology mandates of the Department, but the potential impact of this new position and how it might fit within the BPK clusters was only superficially described. Indeed, this same comment could be made for all the research faculty hires suggested in the Self Study (see some more specific suggestions in the discussion of long-term plans above). This lack of detail was at least partially the result of the bums in seats tone and the apparent miscommunication from SFU administration discussed above. The Review Committee recommends the Department clarifies the strategic rationale for new research faculty hires using research-based arguments within and outside BPK. The Review Committee strongly recommends that serious consideration be given to employing unfilled CRC chairs (see above in long-term planning comments) in the arguments presented. This latter strategy will require discussions with the Dean and the VP-R.

6.3 What more can be done to prepare the KIN, BIF, and BNEU majors for future careers?

Since the Review Committee saw the Co-op program as exemplary, much less attention was paid to this question (see comments above under "Co-op"). As already discussed above, alumni surveys were not supported as a vehicle to do this. Coordination with SFU Co-op and the implementation of graduate exit surveys was a suggested alternative for data collection.

Whereas BIF and BNEU co-op placements represent a significant challenge, as noted above, they also represent a great opportunity. Creating new, innovative co-op experiences will be a highly valuable

enterprise. Although this work may take some time, it seems highly doable given the tremendous past success, particularly in KIN. In the long run this effort will not only create valuable placements, but will spawn innovative career possibilities.

One suggestion the Review Committee could make is to move the soft skill training provided to students taking advantage of co-op experiences to all students. Indeed, since these are leadership skills (e.g., communication) it is easy to argue that these skills should be part of every BPK student's academic training. Similar to the certificates provided for completed co-op placements, a certificate strategy could be developed for "soft skills" training.

6.4 Recommended strategies to optimize/maximize research funding

While the current level of research funding is admirable and indeed likely matches or exceeds many kinesiology-specific departments across Canada, comparisons are difficult. In addition, Dugan O'Neil reported BPK research productivity to be excellent (see comments above under "Research"). Since maximizing research funding implies that (more) money is a quality marker, which may or may not be true, the Review Committee suggests the following strategies for optimizing research funding.

- Whereas administrative research support from the Faculty of Science and above (e.g., support for writing CFI grants) is excellent, there was a sense from many BPK research faculty that more support would be beneficial, particularly around applications for grant funding.
- It would be helpful to sharpen the mentoring process for young researchers in BPK.
- The Review Committee learned of many great initiatives to spawn new research at SFU (e.g., SFU Innovate, Community Trust Endowment Fund). We also learned of the 10-12 unfilled CRC positions at SFU. Most of what the Review Committee then reported to the Department Chair and research faculty with a strikingly lack of awareness in BPK! The Review Committee strongly urges SFU Research and the Faculty of Science to expand and improve timely communication links down to the Departments and individual research faculty. This information is clearly essential to all research stakeholder for future research productivity to be maximized.
- Many BPK research faculty have been exemplary in forging research connections with other researchers across the SFU campus and externally, however, this is not true of all BPK research faculty, particularly some of the younger, inexperienced scientists. The mentoring process mentioned above would help in this regard, however, there could be more support provided at the departmental level. While five BPK research clusters were identified in the BPK Self Study, no leader and leadership process was identified for each cluster. The Review Committee also learned that some of the clusters are "lead" by junior researchers. A leader model and process should be identified by BPK with regular meetings designed to facilitate research ideas. It was reported to the Review Committee that there was little opportunity to discuss research at departmental meetings and elsewhere. Research leadership and discussion need to be much more prominent in the daily life of the department.

6.5 Accelerated BSc/MSc

There was significant support amongst research faculty to implement the accelerated BSc/MSc. In addition, the Review Committee heard support for the idea by SFU upper management. There were several perceived advantages including:

- A means to attract some of the brightest undergrads in the BPK program to a potential research career.

- A means to make up for a decrease in the number of MSc students produced with the accelerated MSc-to-PhD transition program recently implemented in the grad program as a way to attract doctoral students (which was successful).

This strategy requires that undergrad students have access to a supervisor for an undergrad research thesis. Currently there are 10-12 students engaged in these courses. It was anticipated that this number will be sufficient to accommodate the demand for the accelerated BSc/MSc.

- The Review Committee supports the implementation of this new strategy with a caveat. The Self Study document cites the capacity of research faculty to host undergraduates in their research lab as a limiting factor in taking on more undergraduate students for an Honours thesis. We also heard from one faculty member that the percentage of Honours thesis students who move on to graduate school is actually relatively small (~10%). It would seem that strategies should be developed/implemented to increase the pool of undergraduate thesis students if this accelerated BSc/MSc option is to be effective.
- The current number of grad students per faculty (2-3) and total number of grad students in the program was judged by the Dean of Graduate Studies to be adequate at the current level. Increasing the number of grad students assumes there will be enough grant support by individual faculty to support these extra students financially. While this may not be doable for all research faculty, it appears this extra funding will not be problematic for some of the better funded researchers. In this light the Review Committee supports the idea, with a suggested review of the strategy in five years.

Concluding Remarks

It is clear to the Review Committee that BPK is in very good shape. The faculty, staff and students are vibrant, passionate about, and good at what they do. While we have made several suggestions, they are not major, as indeed there is nothing major that needs remedied. It was an extreme pleasure to do this work and the committee members appreciated the great cooperation and kind hospitality shown by all at SFU!

Alan Salmoni

Audrey Hicks

Peter Backx

Wallace MacNaughton

# EXTERNAL REVIEW – ACTION PLAN

## Section 1 – To be completed by the Responsible Unit Person e.g. Chair or Director

| Unit under review | Date of Review Site visit | Responsible Unit person | Faculty Dean |
|---|---|---|---|
| Biomedical Physiology and Kinesiology, Faculty of Science | March 7-9, 2018 | Dr. Angela Brooks-Wilson (Dept. Chair) | Dr. Paul Kench Dean of Science |

***Notes***

1. *It is **not** expected that every recommendation made by the External Review Committee be covered by this Action Plan. The major thrusts of the Report should be identified and some consolidation of the recommendations may be possible while other recommendations of lesser importance may be excluded.*
2. *Attach the required plan to assess the success of the **Educational Goals** as a separate document (Senate 2013).*
3. *Should any additional response be warranted, it should be attached as a separate document.*

## 1. PROGRAMMING

**1.1 Action/s (description what is going to be done):**

**1.1.1 Undergraduate:**

**a) Plan and propose measures to control the number of BPK undergraduate students.**

From the External Review report: "*The Review Committee noted that enrollment management and degree completion time are significant challenges in BPK. .....This is challenging because there is no certainty on student numbers from year to year (numbers have gone up significantly over the past several years), making long-term course scheduling and planning difficult.*"

We will plan measures to better match the volume of students to BPK teaching capacity in order to maintain the high quality of the undergraduate programs and limit course access issues. This will include analysis of measures such as increasing the entrance average from secondary schools and maintaining relatively high continuation and internal transfer GPAs. We will work with the Dean of Science and others to adopt an approach that will help achieve better balance for BPK while still meeting the Faculty of Science enrollment targets.

**b) Develop educational goals and conduct course mapping to inform potential revision of curricula.**

We will develop Educational Goals, conduct course mapping and use this to inform curricular renewal. This process will include consideration of experiential learning, innovation and critical thinking skills.

**c) Indigenization**

We will contribute to SFU's goal of having culturally safe and welcoming spaces by discussing with the Office of Aboriginal Peoples how to make BPK spaces welcome to Indigenous students. We will show welcome to potential Indigenous students by holding events such

as a tour of BPK. Faculty members and staff will be encouraged to take the Student Services' San'yas Indigenous Cultural Safety Training Program, and Faculty members will be encouraged to take the SFU 'Decolonizing Teaching' course.

**1.1.2 Graduate: Graduate program related objectives will be led by the BPK Graduate Program Committee (GPC).**

**a) Examine factors influencing MSc time to completion.**

The GPC will analyze the distribution of MSc degree lengths and will consider the factors influencing it and potential ways to achieve faster completion, while maintaining appropriate standards. Factors to be considered include changes to graduate courses (for example, modular graduate courses are a possibility) and time spent as Teaching Assistants.

**b) Develop a contract for expectations and responsibilities between graduate supervisors and graduate students.**

The contract will include funding and duties of the graduate student and supervisor.

**c) Conduct a systematic assessment of the funding of BPK graduate students in all labs.**

Financial information from online graduate student progress reports will be individually checked with students.

**1.2 Resource implications (if any):**

- Additional advising capacity (+1.0 Undergraduate Advisor) was recommended by the External Reviewers, and is required to support current and future BPK students.

**1.3 Expected completion date/s:**

We expect to complete these goals within 3 years.

# 2. RESEARCH

**2.1 Action/s (what is going to be done):**

a) **Work with the Faculty of Science and VP Research office to propose to strategically build research capacity in technology and innovation in the area of wearable technology in exercise physiology.**

One way to build in this important area would be through designation of a CRC Chair, as well as through new Assistant Professor level hire(s). One senior and one junior hire would be ideal to achieve this goal. Such researchers would benefit from joining a department with strong and varied kinesiology and physiology research at the cellular, systems, organ and whole-body levels as well as expertise in innovation, including the founding of successful biotechnology companies. This would augment SFU's already strong research / innovation context and provide critical mass to contribute to SFU's positioning as a leader in wearable technology.

b) **Seek opportunities to build research strength in Neuroscience to enhance the growing neuroscience emphasis across SFU on multiple campuses.**

A CRC Chair would be one possible funding source to contribute to this goal, or alternatively a new Assistant Professor position. We will work with the Dean of Science and VP Research office to further this goal.

**2.2 Resource implications (if any):**

Resources that would allow achievement of goal 2.1a could include, for example, a CRC Chair and 1 junior researcher hire in the area of wearable technology and exercise physiology

Resources that would allow achievement of goal 2.1b could include, for example, a 1 CRC Chair hire (or new Assistant Professor) in the area of neuroscience

New hires would be associated with research program-specific startup and renovation costs.

New hires would be housed in existing BPK space.

**2.3 Expected completion date/s:**

Dependent on timing of availability of resources such as CRC Chair allocations and new faculty hires.

## 3. ADMINISTRATION

**3.1 Action/s (what is going to be done):**

a) **To inform future curriculum planning, analyze data from co-op employers on student gaps and strengths, and continue an annual exit survey.**

The co-op program carries out ongoing data collection on student performance via employer and student evaluation forms and site visits. This data will be analyzed for indicators that may inform curricular planning. The department will continue to carry out a yearly exit survey, and analyze it for graduating students' perceived curricular gaps.

**3.2 Resource implications (if any):**

**3.3 Expected completion date/s:**

Yearly.

## 4. WORKING ENVIRONMENT

**4.1 Action/s (what is going to be done):**

a) **Add structure to the existing mentorship program for young research faculty.**

Currently, each Assistant Professor who wished to participate has had two successfully funded veteran researchers agree to mentor him or her. Going forward, we will (with input from young faculty members) develop a list of aspects of faculty life for which new faculty need mentoring, for example, strategies for: grant applications, collaborations, publishing, and in particular selection of and mentoring of graduate students and development of their projects. Veteran researchers who are particularly adept in a certain area will be called on to provide mentorship.

b) **The BPK Mental Health and Wellness Committee will continue its important work.**

To date, the BPK Mental Health and Wellness Committee has focused on student mental health and wellness issues; for example, members of this group were among the main advisors regarding design of the new student study space. Going forward, the Committee's mandate will be expanded to include consideration of faculty and staff wellness.

**4.2 Resource implications (if any):**

**4.3 Expected completion date/s:**

Continuing.

| 5. ..... (*OTHER*) |
|---|
| 5.1 <u>Action/s:</u><br>• .....<br>• .....<br>• .....<br><br>5.2 <u>Resource implications (if any):</u><br><br>5.3 <u>Expected completion date/s:</u> |

The above action plan has been considered by the Unit under review and has been discussed and agreed to by the Dean.

| Unit Leader (signed) | Date |
|---|---|
| Name .....Angela Brooks-Wilson..... Title.....Chair..... | .....21 September, 2018..... |

## Section 2 - Dean's comments and endorsement of the Action Plan:

The department is to be congratulated on the constructive and complimentary report received from the external review team.

The goals outlined in the Department's Action Plan are laudable, clearly intended to provide the best education for undergraduate and graduate students, and on-going success in the research and teaching missions. However, some of the details of the action plan may require modification before they are implemented.

While the goal of controlling undergraduate admission from high school is justified, achieving that by regulating grade point average (GPA) at the department level is impractical at present, since admission targets (and thus GPA) are set at the Faculty level and accountability for meeting the targets resides with the Dean. Even if differential GPAs at the department level are attainable, there will need to be very careful consideration of how targets can be met through admissions to other departments – clearly a matter of much discussion.

Science is starting to reassess the current academic advising model. While BPK does have insufficient advising capacity to accommodate its student population, other departments in the Faculty face growing pressure as well. The Faculty and its departments should assess collectively how to meet growing demands for advising in the most efficient and cost-effective manner. In the meantime, Science will work with BPK to provide additional help as needed.

| **Faculty Dean** | **Date** |
|---|---|
| **Name:** Paul Kench **Signature:**  | **12 September, 2018** |

# Undergraduate Educational Goals and Assessment Plan

## (Excerpted from the Self-Study for the 2018 External Review)

Objective: Develop multi-year plan to map and assess the curriculum of each program in Biomedical Physiology and Kinesiology in relation to educational goals. Use evidence to improve programs, inform subcommittees, inform students about programs, and provide data to document that expectations for each program are being met.

Benefits for Faculty: The assessment plan will provide objective analysis that will identify future directions for instructional development. Direct assessment will be utilized for evidence based decisions regarding the status of student achievement in individual classes, and provide indications of teaching success beyond student evaluations. The curriculum mapping process will allow the targeting of instruction to specific level of student knowledge and skill entering course as we will have objective measures of educational goal achievement within prerequisites. The design of targeted assessments for educational goals will provide data on student achievement within individual courses.

Benefits for Students: Students will experience a more cohesive progression through our programs following the implementation of evidence based decisions regarding student achievement. Mapping will provide students with a clearer understanding of what will be covered in a course, and what they are required to master from prerequisite courses. Students will be able to develop clear goals, objective indications of success and skills that can be clearly communicated with future employers.

Development of Educational Goals: Considerable effort has been put in to write Degree Level Expectations for each of our programs over the last five years. The 20-30 expectations for each of our major programs are divided into five categories based on Fink's taxonomy; Foundational Knowledge, Application of Knowledge, Integration of Knowledge, Communication Skills, and Autonomy and Professional Capacity. These categories form the basis for our development of educational goals at the program level. At our recent department retreat we began the prioritization of Degree Level Expectations into five to ten clearly assessable goals per program. Faculty, Staff and Students will continue to be involved in the prioritization and rewriting of the expectations into educational goals for each program.

**Table 1** shows a timeline and assessment plan. Included in the Appendix are DRAFT Degree Level Expectations for the following programs:

- Behavioural Neuroscience Major
- Biomedical Physiology Major
- Biomedical Physiology Minor (Draft)
- Kinesiology Major
- Kinesiology Minor
- Occupation Ergonomics Certificate

**Table 1: Timeline and Assessment Plan**

| Dates | | Steps in Educational Goals Process |
|---|---|---|
| October 2017 | January 2018 | DRAFT degree level expectations for development as educational goals, incorporate into external review self-study along with preliminary assessment plan. |
| February 2018 | April 2018 | Collect course level educational goals from all BPK courses. Provide workshops for faculty who did not develop outcomes for courses during workshops in 2013.<br>Acquire curriculum-mapping program.<br>Initial surface mapping of prioritized expectations. |
| May 2018 | December 2018 | Incorporation of recommendations from external review.<br>Revision of goals.<br>Determination of main objectives for first phase of educational goal assessment process.<br>Prioritization of which courses and methods to assess achievement of goals. |
| January 2019 | December 2019 | Deeper evaluation of first three goals using Fink's taxonomy Foundational Knowledge, Application of Knowledge and Integration of Knowledge. (F, A, I) |
| January 2020 | December 2020 | Deeper evaluation of remaining goals using Fink's taxonomy Foundational Knowledge, Application of Knowledge and Integration of Knowledge. (F, A, I) |
| January 2021 | December 2021 | Analyze data and propose action for four-year update.<br>Consider constructing separate analysis for delivery to Administration, Departmental Subcommittees and Students.<br>Compare to similar programs at other institutions.<br>Address recommendations from External Review using evidence from assessment process. |

# Undergraduate Educational Goals and Assessment Plan

## Objective

Develop multi-year plan to map and assess the curriculum of each program in Biomedical Physiology and Kinesiology in relation to educational goals. Use evidence to improve programs, inform subcommittees, inform students about programs, and provide data to document that expectations for each program are being met.

## Benefits for Faculty

The assessment plan will provide objective analysis that will identify future directions for instructional development. Direct assessment will be utilized for evidence based decisions regarding the status of student achievement in individual classes, and provide indications of teaching success beyond student evaluations. The curriculum mapping process will allow the targeting of instruction to specific level of student knowledge and skill entering course as we will have objective measures of educational goal achievement within prerequisites. The design of targeted assessments for educational goals will provide data on student achievement within individual courses.

## Benefits for Students

Students will experience a more cohesive progression through our programs following the implementation of evidence based decisions regarding student achievement. Mapping will provide students with a clearer understanding of what will be covered in a course, and what they are required to master from prerequisite courses. Students will be able to develop clear goals, objective indications of success and skills that can be clearly communicated with future employers.

## Development of Educational Goals

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At our recent department retreat we began the prioritization of Degree Level Expectations into five to ten clearly assessable goals per program. Faculty, Staff and Students will continue to be involved in the prioritization and rewriting of the expectations into educational goals for each program.

Included in the appendix are the approved Degree Level Expectations for the following programs:

- Behavioural Neuroscience Major
- Biomedical Physiology Major

- Biomedical Physiology Minor (Draft)
- Kinesiology Major
- Kinesiology Minor
- Occupation Ergonomics Certificate

## Timeline and Assessment Plan

| Dates | | Steps in Educational Goals Process |
|---|---|---|
| October 2017 | January 2018 | Prioritize degree level expectation for development as educational goals, incorporate into external review self-study along with preliminary assessment plan. |
| February 2018 | April 2018 | Collect course level learning outcomes from all BPK courses. Provide workshops for faculty who did not develop outcomes for courses during workshops in 2013. |
| | | Acquire curriculum-mapping program. |
| | | Initial surface mapping of prioritized expectations. |
| May 2018 | December 2018 | Incorporation of recommendations from external review. |
| | | Revision of goals. |
| | | Determination of main objectives for first phase of educational goal assessment process. |
| | | Prioritization of which courses and methods to assess achievement of goals. |
| January 2019 | December 2019 | Deeper evaluation of first three goals using Fink's taxonomy Foundational Knowledge, Application of Knowledge and Integration of Knowledge. (F, A, I) |
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| January 2021 | December 2021 | Analyze data and propose action for four-year update. |
| | | Consider constructing separate analysis for delivery to Administration, Departmental Subcommittees and Students. |
| | | Compare to similar programs at other institutions. |
| | | Address recommendations from External Review using evidence from assessment process. |

## Prioritized BPK Degree Level Expectations

Common (C), Kinesiology Major (KIN) and Biomedical Physiology Major (BIF) specific Degree Level Expectations prioritized at the Department Retreat November 2017.

### Foundational Knowledge

(C) explain the individual and interactive function and regulation of major organs and organ systems at levels from genes to behavior.

(KIN) understand the fundamental concepts underlying disciplines related to kinesiology such as anatomy, physiology, exercise physiology, biomechanics, neuromechanics, motor learning, psychology, nutrition and ergonomics

### Application of Knowledge

(C) show a working understanding of major methods of inquiry, and use these approaches and techniques to identify, isolate, and address problems.

(KIN) apply appropriate techniques to assess function, fitness and risks related to health and injury

(KIN) apply foundational knowledge to design and implement exercise programs for healthy and unhealthy individuals and populations, to prevent or manage injury and/or enhance performance

(KIN) apply foundational knowledge to implement rehabilitation and/or nutrition programs for healthy, unhealthy and at-risk individuals and populations, to prevent dysfunction and/or enhance performance

### Integration of Knowledge

(C) integrate and synthesize a broad range of knowledge, skills and scientific approaches and apply these to diverse and novel challenges

(BIF) evaluate the strengths and limitations of various approaches and thereby be able to justify the choice of mode of inquiry and of analysis to answering questions and solving problems.

### Communication Skills

(C) critically evaluate the scientific integrity of information presented in various forms, and detect and understand the implications of logical flaws and misdirection in an argument

(C) develop and communicate engaging scientific arguments in oral presentations, class discussions and written papers.

(C) use relevant scientific, technological, and statistical concepts, data and skills to explain and clarify ideas to diverse target audiences

### Autonomy and Professional Capacity

(C) demonstrate critical, creative, and practical thinking to function autonomously as a self-directed learner throughout life

(C) work effectively with others as part of a team, and provide team leadership when appropriate

(C) demonstrate personal responsibility, ethical decision making, academic integrity, and social responsibility

(KIN) meet the academic and practical requirements of several discipline specific provincial, national and international certifications

# Degree Learning Expectations for the Kinesiology Major

All expectations should be read to include the initial clause: "A graduate from this program is able to"

## Foundational Knowledge

a) apply scientific knowledge to the study of human movement, physiology and health
b) explain individual and interactive normal function of major organs and organ systems at levels from cells to behaviour
c) understand the fundamental concepts underlying disciplines related to kinesiology such as anatomy, physiology, exercise physiology, biomechanics, neuromechanics, motor learning, psychology, nutrition and ergonomics
d) critically evaluate the scientific integrity of information

## Application and Integration of Knowledge

a) integrate foundational knowledge into the broad scope of health, fitness and illness
b) apply appropriate techniques to assess function, fitness and risks related to health and injury
c) apply foundational knowledge to design and implement exercise programs for healthy and unhealthy individuals and populations, to prevent or manage injury and/or enhance performance
d) apply foundational knowledge to implement rehabilitation and/or nutrition programs for healthy, unhealthy and at risk individuals and populations, to prevent dysfunction and/or enhance performance
e) demonstrate a working understanding of major methods of inquiry in kinesiology, including their strengths and limitations.
f) integrate and synthesize a broad range of knowledge, skills and scientific approaches and apply these to diverse and novel challenges
g) justify choice of mode of inquiry and analysis to answer questions and solve problems
h) develop and sustain a reasoned argument and be able to detect illogical arguments
i) understand limitations when researching human health and behaviour
j) appreciate what one doesn't know and what the scientific community doesn't know

## Communication Skills

a) read and understand discipline specific information
b) listen, question and clarify to understand and appreciate points of view of others
c) write, speak and present information in an engaging and effective manner
d) use relevant scientific, technological, and statistical concepts, data and skills to explain and clarify ideas to diverse target audiences

## Autonomy and Professional Capacity

a) demonstrate critical, creative, and practical thinking

b) demonstrate the ability to function autonomously as a self-directed learner throughout life
c) work effectively with others as part of a team and provide team leadership when appropriate
d) demonstrate personal responsibility, accountability and ethical decision making in complex contexts
e) demonstrate behavior consistent with academic integrity, standards of professional practice and social responsibility
f) meet the academic requirements of several discipline specific provincial, national and international certifications.
g) qualify for membership in British Columbia Association of Kinesiologists (BCAK)

## Honours

a) critique current research on methodological and statistical grounds
b) identify gaps in the relevant literature, formulate questions and a testable hypothesis
c) use learned procedures to evaluate which data are relevant and which are not, and to be able to explain the rational for these decisions
d) design a study to test the hypothesis
e) interpret the study results, draw defendable conclusions and understand their limitations
f) write and defend a thesis in an appropriate scientific format

# Degree Level Expectations for the Kinesiology Minor

All expectations should be read to include the initial clause: "A graduate from this program is able to"

## Foundational Knowledge

a) translate scientific knowledge to the study of human movement, physiology and health
b) recall individual and interactive normal function of major organs and organ systems at levels from cells to behaviour
c) understand the fundamental concepts underlying some of the disciplines related to kinesiology such as anatomy, physiology, exercise physiology, biomechanics, neuromechanics, motor learning, psychology, nutrition and ergonomics
d) evaluate the scientific integrity of information

## Application and Integration of Knowledge

a) use foundational knowledge into the broad scope of health, fitness and illness
b) apply foundational knowledge to design and implement exercise programs for oneself.
c) apply foundational knowledge to implement rehabilitation and/or nutrition programs for oneself.
d) demonstrate an understanding of major methods of inquiry in kinesiology, including their strengths and limitations.
e) develop and sustain a reasoned argument and be able to detect illogical arguments
f) understand limitations of human health and behaviour research

## Communication Skills

a) read and understand discipline specific information
b) listen, question and clarify to understand and appreciate points of view of others
c) write, speak and present information in an effective manner

## Autonomy and Professional Capacity

a) demonstrate critical, creative, and practical thinking
b) demonstrate the ability to function autonomously as a self-directed learner throughout life
c) work effectively with others as part of a team
d) demonstrate personal responsibility, accountability and ethical decision making ~~in~~
e) demonstrate behavior consistent with academic integrity and social responsibility

# Degree Learning Expectations for the Occupational Ergonomics Certificate within the Kinesiology Major

All expectations should be read to include the initial clause: "A graduate from this program is able to"

## Foundational Knowledge

a) apply scientific knowledge to the study of humans in occupational environments
b) apply a systems approach to understanding, assessing and improving the interaction between social and technical elements in the workplace
c) critically evaluate the scientific integrity of ergonomics research
d) understand how the fundamental concepts underlying disciplines related to kinesiology such as anatomy, physiology, exercise physiology, biomechanics, anthropometry, motor learning, and psychology, account for risk development and provide solutions to address risks in the workplace

## Application and Integration of Knowledge

a) integrate foundational knowledge into the broad scope of physical and mental health and illness in the workplace
b) apply appropriate techniques to assess individual differences, task requirements, and environmental characteristics within the workplace
c) apply foundational knowledge to design and implement effective solutions to prevent or manage physical and mental injury and/or enhance performance
d) apply foundational knowledge to implement ergonomic, wellness and rehabilitation programs for healthy, unhealthy and at risk individuals and populations, to prevent dysfunction and/or enhance performance in the workplace
e) demonstrate a working understanding of major methods of inquiry in ergonomics, including their strengths and limitations
f) demonstrate a working understanding of Provincial, Federal and International legislation, standards and guidelines/standard practices relating to ergonomics in the workplace
g) integrate and synthesize a broad range of knowledge, skills and scientific approaches and apply these to diverse and novel challenges
h) justify choice of mode of inquiry and analysis to answer questions and solve problems
i) develop and sustain a reasoned argument and be able to detect illogical arguments
j) understand limitations when researching human health and behaviour
k) appreciate what one doesn't know and what the scientific community doesn't know

## Communication Skills

a) read and understand discipline specific information
b) listen, question and clarify to understand and appreciate points of view of others
c) translate knowledge effectively in both written and oral formats to diverse target audiences

d) write in a variety of formats, specific to the discipline of ergonomics, in an engaging and effective manner
e) use relevant scientific, technological, and statistical concepts, data and skills to explain and clarify ideas to diverse target audiences

## Autonomy and Professional Capacity

a) demonstrate critical, creative, and practical thinking
b) demonstrate the ability to function autonomously as a self-directed learner throughout life
c) work effectively with others as part of a team and provide team leadership when appropriate
d) demonstrate personal responsibility, accountability and ethical decision making in complex contexts
e) demonstrate behavior consistent with academic integrity, standards of professional practice and social responsibility
f) meet the academic requirements of the Canadian Certification of Professional Ergonomists
g) qualify for membership in the Association of Canadian Ergonomists

# Degree Level Expectations for the Biomedical Physiology Major

All expectations should be read to include the initial clause: "A graduate from this program is able to"

## Foundational Knowledge

*(see Note 2)

a) explain the individual and interactive normal function of major organs and organ systems at levels from cells to behavior
b) explain the individual and interactive regulation of major organs and organ systems at all levels from gene transcription to behavior
c) demonstrate command of material that probes current understanding of a subdiscipline of physiology (see note 3)
d) demonstrate an appreciation of the areas and ways in which physiology intersects with neighboring disciplines (e.g. biochemistry, anatomy, psychology, zoology)

## Application of Knowledge

a) show a working understanding of major methods of inquiry for acquiring new understanding in physiology, including their strengths and limitations
b) use these approaches and techniques to identify, isolate, and address problems

## Integration of Knowledge

a) integrate and synthesize a broad range of knowledge and skills and apply these to diverse and novel challenges
b) evaluate the strengths and limitations of various approaches and thereby be able to justify the choice of mode of inquiry and of analysis to answering questions and solving problems
c) develop and sustain a reasoned argument
d) appreciate what she doesn't know and what the scientific community doesn't know
e) detect and understand the implications of logical flaws / misdirection in an argument

## Communication Skills

a) read and understand information presented in various forms (words, graphs, charts, diagrams, tables)
b) listen and ask questions to understand and appreciate the points of view of others – to be sure she understands the argument that is being developed.
c) write and speak so others pay attention and understand
d) use relevant scientific, technological, and mathematical concepts, data, and skills to explain or clarify ideas in an audience specific manner in more than 140 characters.
e) create and present developed arguments for diverse target audiences in oral, visual, written, and electronic formats – see also (1.a, 1.b, 3.a,3.c, 4.b)

## Autonomy and Professional Capacity

a) demonstrate critical, creative, and practical thinking (see note 4).
b) show the foundational knowledge, application and integrative skills to function autonomously as a self-directed learner throughout life.
c) work effectively with others as part of a team, and provide team leadership when appropriate
d) demonstrate personal responsibility, accountability, and skills of inclusion and ethical decision-making in complex contexts
e) use the comprehension and skills described herein to distinguish between science and pseudoscience.
f) demonstrate behavior consistent with academic integrity, standards of professional practice, and social responsibility

## Notes

1. The subject headings "Foundational Knowledge", "Application of Knowledge", "Integration of Knowledge", "Autonomy and Professional Capacity" are used as defined in Fink's taxonomy of learning {"A Taxonomy of Significant Learning", in: Fink LD. Creating significant learning experiences. San Francisco, Jossey-Bass, 2003; 27-59} which is on Docushare.

2. The PIGs committee recognizes that many words used here in a technical sense have multiple definitions. For example, Wiktionary shows 10 definitions for "knowledge". Accordingly we have decided to agree on a single definition, taken from Wiktionary, for such words. Thus: Knowledge == "Awareness of a particular fact or situation, a state of having been informed or made aware of something."

3. For the purpose of this document subdisciplines of physiology align with the research groups in BPK – Cardiovascular physiology, neuroscience, neuromechanics, environmental physiology, chronic disease

4. Critical thinking refers to the process of analyzing and evaluating something. Creative thinking occurs when one imagines and creates a new idea, design, or product; thus novelty and "fit with the context" play a key role. Practical thinking occurs when a person is learning how to use and apply something, as when trying to solve a problem or make a decision. The product here is a solution or decision whose effectiveness is paramount. {Fink, pp39-40}.

## Honors (not developed)

a) from the literature identify gaps in current comprehension of that portion of the discipline that is addressed by the thesis.
b) critique current research on methodological and statistical grounds
c) demonstrate intellectual rigor – this implies crafting an argument using a careful and "rigorous" procedure to evaluate which data are relevant to the argument and which are not (and why). The argument is developed using only the relevant data and "rigorously" excluding irrelevant data.

d) formulate informative questions about gaps identified in (6.a)
e) from the questions formulated in (6.d) craft testable hypotheses
f) design a study to test the hypothesis crafted in (6.e)
g) interpret the results of the study (6.f) in terms of the hypothesis (6.e)
h) integrate knowledge from various sub-disciplines to address contemporary issues in physiology.
i) show understanding of the reliability, utility, and relevance of information from multiple sources
j) appreciate the uncertainty, ambiguity and limits to understanding and methodologies and the ways in which these limitations might influence the analysis, interpretation and dissemination of information and skills

# Degree Level Expectations for the Biomedical Physiology Minor

All expectations should be read to include the initial clause: "A graduate from this program is able to"

## Foundational Knowledge

*(see Note 2)

a) explain the individual and interactive normal function of major organs and organ systems at levels from cells to behavior
b) explain the individual and interactive regulation of major organs and organ systems at all levels from gene transcription to behavior
c) demonstrate command of material that probes current understanding of a subdiscipline of physiology (see note 3)
d) demonstrate an appreciation of the areas and ways in which physiology intersects with neighboring disciplines (e.g. biochemistry, anatomy, psychology, zoology)

## Application of Knowledge

a) show a working an understanding of major methods of inquiry for acquiring new understanding in physiology, including their strengths and limitations.
b) use these approaches and techniques to identify, isolate, and address problems.

## Integration of Knowledge

a) integrate and synthesize use a broad range of knowledge and skills and apply these to diverse and novel challenges
b) evaluate the strengths and limitations of various approaches and thereby be able to justify the choice of mode of inquiry and of analysis to answering questions and solving problems
c) develop and sustain a reasoned argument
d) appreciate what she doesn't know and what the scientific community doesn't know
e) detect and understand the implications of logical flaws / misdirection in an argument

## Communication Skills

a) read and understand information presented in various forms (words, graphs, charts, diagrams, tables)
b) listen and ask questions to understand and appreciate the points of view of others – to be sure she understands the argument that is being developed
c) write and speak so others pay attention and understand
d) use relevant scientific, technological, and mathematical concepts, data, and skills to explain or clarify ideas in an audience specific manner in more than 140 characters
e) create and present developed arguments for diverse target audiences in oral, visual, written, and electronic formats – see also (1.a, 1.b, 3.a,3.c, 4.b)

## Autonomy and Professional Capacity

a) demonstrate critical, creative, and practical thinking (see note 4).
b) show the foundational knowledge, application and integrative skills to function autonomously as a self-directed learner throughout life.
c) work effectively with others as part of a team, and provide team leadership when appropriate
d) demonstrate personal responsibility, accountability, and skills of inclusion and ethical decision making in complex contexts
e) use the comprehension and skills described herein to distinguish between science and pseudoscience.
f) demonstrate behavior consistent with academic integrity, standards of professional practice, and social responsibility

## Notes

1. The subject headings "Foundational Knowledge", "Application of Knowledge", "Integration of Knowledge", "Autonomy and Professional Capacity" are used as defined in Fink's taxonomy of learning {"A Taxonomy of Significant Learning", in: Fink LD. Creating significant learning experiences. San Francisco, Jossey-Bass, 2003; 27-59} which is on Docushare.

2. The PIGs committee recognizes that many words used here in a technical sense have multiple definitions. For example, Wiktionary shows 10 definitions for "knowledge". Accordingly we have decided to agree on a single definition, taken from Wiktionary, for such words. Thus: Knowledge == "Awareness of a particular fact or situation, a state of having been informed or made aware of something."

3. For the purpose of this document subdisciplines of physiology align with the research groups in BPK – Cardiovascular physiology, neuroscience, neuromechanics, environmental physiology, chronic disease

4. Critical thinking refers to the process of analyzing and evaluating something. Creative thinking occurs when one imagines and creates a new idea, design, or product; thus novelty and "fit with the context" play a key role. Practical thinking occurs when a person is learning how to use and apply something, as when trying to solve a problem or make a decision. The product here is a solution or decision whose effectiveness is paramount. {Fink, pp39-40}.

# Degree Learning Expectations for the Behavioural Neuroscience Major

All expectations should be read to include the initial clause: "A graduate from this program is able to"

## Foundational Knowledge

a) explain how the nervous system communicates, and how information is coded and stored in the brain
b) explain how the nervous system senses information necessary to interact in a given environment
c) explain the function of different brain regions and how they work together to produce or control behaviour and cognition
d) understand the fundamental concepts underlying disciplines related to behavioural neuroscience, including neuroanatomy, physiology, and psychology

## Application and Integration of Knowledge

a) demonstrate a working understanding of major methods of inquiry for acquiring new understanding in behavioural neuroscience, including their strengths and limitations
b) integrate foundational knowledge to describe the potential reasons for signs and symptoms associated with a variety of neurological disorders
c) apply foundational knowledge to design ways to maintain or improve brain health and function
d) integrate and synthesize a broad range of knowledge, skills, and scientific approaches and apply these to diverse and novel challenges
e) justify choice of mode of inquiry and analysis to answer questions and solve problems
f) develop and sustain a reasoned argument based on behavioural neuroscience research
g) appreciate what one doesn't know and what the scientific community doesn't know

## Communication Skills

a) read and understand discipline specific information
b) listen, question, and clarify to understand and appreciate points of view of others
c) write, speak, and present information in an engaging and effective manner
d) use relevant scientific, technological, and statistical concepts, data, and skills to explain and clarify ideas to diverse target audiences

## Autonomy and Professional Capacity

a) demonstrate critical, creative, and practical thinking
b) demonstrate the ability to function autonomously as a self-directed learner throughout life
c) work effectively with others as part of a team and provide team leadership when appropriate
d) demonstrate personal responsibility, accountability, and ethical decision making in complex contexts

e) demonstrate behavior consistent with academic integrity, standards of professional practice, and social responsibility
f) use the comprehension and skills described herein to distinguish between science and pseudoscience

## Honours Program

a) critique current research on methodological and statistical grounds
b) identify gaps in the relevant literature, formulate questions, and a testable hypothesis
c) use learned procedures to evaluate which data are relevant and which are not, and to be able to explain the rational for these decisions
d) design a study to test the hypothesis
e) interpret the study results, draw defendable conclusions and understand their limitations
f) write and defend a thesis in an appropriate scientific format

## Graduate degree Program Level Outcomes

A graduate from this program is able to:

MSc

a) demonstrate advanced knowledge in, and a critical awareness of, a specialized area within the fields of Biomedical Physiology and Kinesiology
b) conduct research in novel lines of enquiry to generate and/or test a hypothesis, which demonstrates mastery of a scientific approach

PhD

a) demonstrate a thorough understanding of pertinent literature and recognize and integrate complex ideas and controversies in the field
b) conceptualize, design and undertake independent research using novel ideas and/or approaches to address a series of questions related to a common goal, which result in original contributions to knowledge in the field

MSc and PhD

a) demonstrate initiative, intellectual independence, problem-solving skills, and the ability to apply knowledge
b) communicate and defend their work, as well as critically appraise that of others, in written and oral form
c) identify moral, legal and ethical considerations for how to conduct research appropriately

## Graduate Degree Level Expectations

| | MSc | PhD |
|---|---|---|
| 1) Core Knowledge and critical thinking | a) demonstrate advanced knowledge of pertinent literature in a specialized area within Biomedical Physiology and Kinesiology<br>b) recognize debate, and critically appraise current research in the field<br>c) evaluate methodological strengths and weaknesses in the literature and understand how this enables/limits interpretation of data | a) demonstrate thorough knowledge of literature related to an area within Biomedical Physiology and Kinesiology<br>b) critically evaluate current literature and integrate complex ideas and controversies in the field<br>c) identify and understand new and established approaches that are at the forefront of the field |
| 2) Research methods and analyses | a) demonstrate mastery of quantitative and/or qualitative skills in the collection and/or use of data<br>b) conduct novel research to generate and/or test a hypothesis<br>c) use established or novel ideas and/or approaches to address a new question<br>d) contribute to the generation of new knowledge in the field | a) conceptualize and design approaches to address a series of research questions<br>b) undertake independent research using novel ideas and/or approaches to generate and/or test a set of hypotheses or questions related to a common goal<br>c) produce original research, which creates new knowledge that advances the field. |
| 3) Literacy and scientific communication | a) present a detailed and comprehensive evaluation of a field of literature in written form<br>b) orally present and defend their critical appraisal of the work of others<br>c) write accessible descriptions of their research for the purposes of knowledge translation<br>d) convey their research to multiple audiences in oral and written form<br>e) present and defend the rationale, approach and interpretation of their own research in written and oral form | a) comprehensively evaluate pertinent literature, addressing complexities and controversies in the field, in written form<br>b) orally present and defend their critical appraisal of the work of others<br>c) write accessible descriptions of their research for the purposes of knowledge translation<br>d) convey their research to multiple audiences in oral and written form<br>e) present and defend the rationale, approach and interpretation of their own research in written and oral form |

| | | |
|---|---|---|
| 4) Professional and ethical conduct | a) identify and adhere to moral, legal and ethical considerations for how to conduct research appropriately<br>b) manage their own research project<br>c) engage in professional conduct with their peers and the scientific community<br>d) display academic integrity<br>e) demonstrate proficiency in teamwork and leadership<br>f) demonstrate initiative, intellectual independence and the ability to apply knowledge | a) identify and adhere to moral, legal and ethical considerations for how to conduct research appropriately<br>b) demonstrate independence in project conceptualization, design, and management<br>c) engage in professional conduct with their peers and the scientific community<br>d) display academic integrity<br>e) demonstrate autonomy and strong leadership<br>f) understand the broader implications of the application of knowledge in their own and others field or discipline |