Final Assessment Report

Cognitive Science (Minor, GDip) and Theoretical Neuroscience (GDip)

February 2024

Executive Summary

External reviewers found that the Cognitive Science (Minor, GDip) and Theoretical Neuroscience (GDip) delivered by the Department of Philosophy (now Psychology)[1] were in good standing.

"Student satisfaction levels appear to be high. The programs benefit from very high levels of faculty expertise, and strong commitments to interdisciplinary knowledge creation and learning. The reviewers were particularly impressed by the high degree of collaborative engagement among the participating departments and faculty members."

A total of three recommendations were provided by the reviewers, regarding program oversight, upper-year courses, and conformity with other graduate diplomas. In response, the program created a plan outlining the specific actions proposed to address each recommendation as well as a timeline for implementation. The next cyclical review for this program is scheduled for 20272028.

Enrollment over the past three years

	Cognitive Science Minor*
2023-2024 (CURRENT YR)	45
2022-2023 (LAST YR)	38
2021-2022 (THREE YRS)	35

*Based on Active Student extract from Quest on February 21, 2024.

[1] The administrative home unit changed between the program response and FAR. It is now administered by the Department of Psychology.

Completion in the past three years

	Cognitive Science GDip**	Theoretical Neuroscience GDip**
2023-2024 (CURRENT YR)	1	1
2022-2023 (LAST YR)	0	1
2021-2022 (THREE YRS)	0	0

**Based on Data Extract provided directly by Records on Feb.28, 2024.

Background

In accordance with the University of Waterloo's Institutional Quality Assurance Process (IQAP), this final assessment report provides a synthesis of the external evaluation and the internal response of the Cognitive Science (Minor, GDip) and Theoretical Neuroscience (GDip) delivered by the Department of Philosophy (now Psychology)[2]. A self-study (Volume I, II, III) was submitted to the Associate Vice-President, Academic and Associate Vice-President, Graduate Studies and Postdoctoral Affairs on July 6, 2021. The self-study (Volume I) presented the program descriptions and learning outcomes, an analytical assessment of the programs, including the data collected from a student survey, along with the standard data package prepared by the Office of Institutional Analysis & Planning (IAP). The CVs for each faculty member with a key role in the delivery of the program(s) were included in Volume II of the self-study.

As a minor, this program was appraised by two faculty members from University of Waterloo, one with knowledge of the program and one from a faculty not associated with the minor: Dr. Lori Curtis, Professor of Economics, University of Waterloo, and Dr. Neil Craik, Professor of International and Canadian Environmental Law, University of Waterloo.

Reviewers appraised the self-study documentation and conducted a site visit to the University on March 21-23, 2022. The visit included interviews with the Associate Vice-President, Graduate Studies and Postdoctoral Affairs; Dean of the Faculty of XXX; Faculty Associate Dean(s) of Undergraduate and Graduate Studies; Chair of the Department, as well as faculty members, staff and current undergraduate and graduate students. The Review Team also had an opportunity to meet with representatives from the library.

[2] The administrative home unit changed between the program response and FAR. It is now administered by the Department of Psychology.

Following the site visit, the external reviewers submitted a report on their findings, with recommendations. Subsequently, the program responded to each recommendation and outlined a plan for implementation of the recommendations. Finally, the Dean responded to the external reviewers' recommendations, and endorsed the plans outlined by the program.

This final assessment report is based on information extracted, in many cases verbatim, from the self-study, the external reviewers' report, the program response and the Dean's response.

Program Characteristics

Both programs share a strong commitment to interdisciplinarity, a core research goal of the University of Waterloo. Interdisciplinarity is a recurring theme in the University of Waterloo's Strategic Plan 2020-2025. These programs are two of the best examples of interdisciplinary training offered at the University.

Cognitive science is the interdisciplinary study of mind and intelligence, embracing psychology, philosophy, linguistics, neuroscience, anthropology, computer science, and engineering. The study of the mind is exciting for theoretical reasons, since the attempt to investigate the nature of thinking is as challenging as anything attempted by science.

Cognitive science is also exciting for practical reasons, since knowing how the mind works is important for improving education, treating mental illness, improving design of computers and other artefacts, and developing expert systems. The study of the mind is inherently interdisciplinary, requiring the diverse insights and methodologies of psychologists, philosophers, computer scientists, linguists, neuroscientists, anthropologists, and other thinkers. The Cognitive Science Minor and Graduate Diploma invite students to join these investigations.

The CTN has chosen to implement a diploma because it is the most effective way to indicate special expertise in theoretical neuroscience, while not limiting employment options of students after graduation. Employers, both academic and industrial, are familiar with standard degree designations but may be unaware of the training involved in a program which awards a Doctoral or Master's degree in Theoretical Neuroscience. Nevertheless, having a specific Diploma in Theoretical Neuroscience will indicate to potential employers officially recognized areas of specialization within a chosen discipline.

Summary of Strengths, Challenges and Weaknesses based on Self-Study

Cognitive Neuroscience

Strengths

- Students (undergraduate and graduate) report very high levels of satisfaction with the program. (The appendix includes response data for both undergraduate and graduate students, which were numerically similar. However, because the graduate student sample size was much smaller, we focus our reporting here on the undergraduates, whose sample size was much larger.) On a seven-point scale (1 “strongly disagree” – 7 “strongly agree”), in response to the statement, “My experience in the program was satisfactory,” mean response was 6.23 (SD = .80, n = 30).
- Students rate the quality of teaching in the program very highly. On a seven-point scale (1 “strongly disagree” – 7 “strongly agree”), in response to the statement, “Teaching quality in the program's courses is good,” mean response was 6.13 (SD = .62, n = 30).
- The program requirements are clear and adequately communicated to students. On a seven-point scale (1 “strongly disagree” – 7 “strongly agree”), in response to the statement, “The program requirements are clear,” mean response was 5.83 (SD = 1.16, n = 30).
- Associated faculty are world leaders in their fields. A number of students remarked upon this during consultations.
- The program is highly interdisciplinary. This significantly enhances students’ experience in their home programs. A number of students remarked upon this during consultations.
- Based on student consultations, students view the program’s requirements as flexible and reasonable.
- The program provides a coherent, organized framework for students to study the mind and intelligence from multiple disciplinary perspectives.

Challenges

- Hiring a replacement for Prof. Paul Thagard, who retired in 2016, was a common suggestion for improvement in faculty consultations. Hiring a replacement for Thagard was also the top recommendation made by the external reviewers for the Philosophy Department’s most recent program review (External Reviewer Report, 2017, p. 11). The external reviewers noted, “the retirement of Paul Thagard, a world-renowned expert in philosophy of mind, is a significant loss to the Department and poses a great challenge to the Department’s continued delivery and development of the Cognitive Science program,” and that “losing him without a replacement would be a serious blow.” In its official response to those recommendations, the Philosophy Department agreed that replacing

Thagard "is vitally important" ("Philosophy Response to External Review Report," 2017, p. 3).*

- Some departments don't recognize teaching contributions to the program made by their faculty members. Consultations revealed that faculty in some departments are asked to teach the graduate seminar (COGSCI 600) essentially *pro bono* — without compensation and without it counting toward their performance evaluation, either in terms of teaching or as creditable service.
- Adding a cognitive science major was perhaps the most common suggestion for improvement from students. But it is yet unclear whether there is sufficient support for growing the program in this way. Specifically, faculty level support has not been provided for this effort although a proposal was provided by the Philosophy Department after receiving unanimous support at the departmental level in 2015. Achieving broader support requires additional questions being addressed regarding the strategic value of such an initiative.
- Students report frustration and dismay at non-Arts students having to pay more than Arts students to take COGSCI listed courses.
- The rules for a Type 2 diploma recently changed and the requirements for a Cognitive Science Diploma no longer satisfy them. The requirements need to be updated to be in compliance.

** Since the writing of the Self-Study, it became clear that Philosophy would not be able to prioritize a hire in Cognitive Science (given other needs in their Department) and the decision was made to move the administration of the program to the Psychology department. Psychology has several existing faculty members and two new hires (Sam Johnson, Clara Colombatto) with interests in Cognitive Science. As such, additional faculty hires in Philosophy (or the Cog Sci area in general) are not a current challenge. To address the other challenges, Psychology has appointed Sam Johnson as the Cognitive Science program board chair and he has convened a faculty advisory group to consider the future of the CogSci minor and GDip. Their primary goal at this point is to increase the visibility of the minor and to build enrollments in the minor. As such, developing a major is not a primary focus at this point in time.*

Weaknesses

- Students sometimes find it challenging to complete the requirements.
- Potentially declining enrollment.
- Uneven enrollments year-to-year in COGSCI 600.
- Lack of consistent research opportunities for undergraduates.
- Some faculty and students view it as a weakness that the program is housed in the Philosophy Department.
- Communication and coordination among contributing departments could be better, to help ensure the program's continued coherence and vitality.
- The program lacks an organizing influence since Paul Thagard retired.

Theoretical Neuroscience

Strengths

- Associated faculty are world leaders in the field.
- The program is highly interdisciplinary. This significantly enhances students' experiences in their home programs and helps them develop as interdisciplinary researchers.
- It provides a coherent, organized framework for students to understand how the brain works.
- The program's leadership is collaborative and collegial.
- The program has maintained a robust sense of community among the faculty and students, through events, seminars, and shared social space.

Challenges

- There is a perception that there are additional barriers for students not based in Arts to earn the diploma. This issue did not arise in the student consultations, but it became apparent in the faculty consultations. That is, this is a perception that some faculty have regarding their students' experience.
- The rules for a Type 2 diploma recently changed and the requirements for the Theoretical Neuroscience Diploma no longer satisfy them. The requirements need to be updated to be in compliance.
- Encouraging a higher participation rate in the diploma from graduate students of CTN faculty members would strengthen the program.

Weaknesses

- The program could be strengthened by greater involvement of experimental neuroscientists to complement its significant strengths in theoretical approaches. The program itself has no dedicated faculty lines, but one way this could occur is though serendipitous hiring by one of the participating departments (e.g., Biology).
- Some participating faculty see an opportunity for better promotion and visibility in the campus community.
- There is a perception among some faculty that the process for completing and submitting all the reports for the seminar series (a requirement for the graduate diploma) can be a bit cumbersome.
- The program was affected by the retirement of Prof. Paul Thagard, who strongly influenced the development of the CTN and many of the core faculty members.

Summary of Key Findings from the External Reviewers

"The Cognitive Science-Minor functions well, and does not require significant changes, although the program would benefit from a more formalized administrative structure in order to coordinate course offerings and improve the visibility of this important program. The program may also benefit from attention to consolidating interdisciplinary knowledge towards the end of the program.

The key challenge facing the two graduate diplomas is the need to bring the programs into conformity with the University's requirements for Type 2 Graduate Diplomas. There are no simple solutions in addressing this issue given the tension between the need for flexibility and the increased demands on students those revisions would require."

Program Response to External Reviewers' Recommendations

1. Create a formal program board to manage and oversee the CogSci-M and CogSci-GD programs. The program board should include key faculty from participating units and should be understood as contributing an important administrative service to the University by participating departments. The program board would be responsible for identifying available courses to satisfy the program requirements, including CogSci 600, and ensuring appropriate communications and promotion of the programs, including a clear website, to students is undertaken.

Program Response

Creation of a formal program board is an apt recommendation. The board should be open to reps from participating departments, which includes Philosophy, Psychology, Anthropology, English, French, Communication Arts, Systems Design Engineering, Computer Science, Electrical and Computer Engineering, Biology, Kinesiology, and Knowledge Integration. It's not necessary that each contributing unit have a rep on the board each year; a board of 7-8 members would allow for reasonable representation and interdisciplinarity. Each board member will serve two years, and each year the current board will solicit volunteers and select from those. The program board will communicate with other units across campus about the principle that serving on the CogSci board is an important and valuable service.

Dean's Response

The Dean endorses the program's response to this recommendation.

2. Creation of an upper year undergraduate course for the CogSci-M program that would integrate and consolidate interdisciplinary knowledge in the program. Consideration to be given to structuring the course to be "held with" the existing CogSci 600 course.

Program Response

We will consider the best way to implement the idea of an upper-division undergraduate course that integrates and consolidates interdisciplinary knowledge in the CogSci-M program. As we noted in a follow-up question to the reviewers, the course PHIL/PSYCH 447: Seminar in Cognitive Science is already a core course in the program, so one possibility would be to make this course required. In response to questions about this path for PHIL/PSYCH 447, the reviewers noted that aligning a new course with CogSci 600 would "address uneven enrolment in CogSci 600" and that making 447 required might put an additional strain on teaching resources. The reviewers also note that "Making Phil 447 a required course would be a viable option – subject to working out resource requirements – but CogSci 600 has some built in flexibility that may suit the wider range of student interests." However, one potential factor to consider is that graduate programs have limits on how much graduate instruction is in the form of courses that also have undergraduates in them; as it stands, CogSci 600 provides a graduate-student-only experience that is valuable in graduate programs. And CogSci 600 functions more as a starting point for graduate study than an end point to undergraduate study. So there may be reasons to pursue the possibility of making 447 required instead. We will consider each option in light of the following recommendation.

Dean's Response

The Dean recognizes the value of the recommendation and the constraints and concerns expressed by the program leadership. The proposal to require 447 for the minor, given that it is already offered regularly, may be a sound solution to the issue identified by the reviewers. That said, programs need to keep in mind that, in situations where resources are constrained (the current state of affairs), maximum flexibility is desirable.

3. Given the absence of a clear solution to bringing the TN-GD and CogSci-GD into conformity with the Type II Graduate Diploma requirements, a further discussion engaging the Graduate Studies Office ought to be undertaken, in light of the key findings of this report:

a. Adding new, additional (to the student's degree program) course requirements to both graduate diplomas appears likely to affect the desirability of the programs;
b. Adding milestones as an additional requirement is a potential avenue, but would require careful design and consideration of the administrative requirements for verifying and tracking requirements;

c. The University's Strategic Plan emphasizes flexibility in interdisciplinary program design;
d. There appears to be low demand for additional credentials that a graduate diploma may signify at the Ph. D. level (particularly in theoretical neuroscience);
e. The collaborative degree model at the graduate level, while a more radical solution, may be a useful option to consider, particularly in light of the University's considerable depth of expertise in both fields, and in light of the strategic importance of the fields, as identified in the University's Strategic Plan.

Program Response

The calendar has now been updated to say that courses cannot be double-counted CogSciGD, which formally brings this program into conformity with the Diploma requirements. As the reviewers note, this way of resolving the difficulty may negatively impact enrolments. We will update CS-TN in a similar way and consider other possible ways forward for both diplomas during this academic year in consultation with the Graduate Studies Office as well as other involved units. We are grateful to the reviewers for pointing out these five considerations that will be kept in mind during those discussions.

Dean's Response

Conformity with Diploma requirements is a good solution, although we will monitor enrollments. Graduate Studies and Postdoctoral Affairs at the university is encouraging more diplomas of this sort, and perhaps with more graduate student awareness of the enhancement that comes with an additional diploma to their degree, enrollments may remain steady and could even attract additional students.

Recommendations Not Selected for Implementation

Not applicable

Implementation Plan

	Recommendations	Proposed Actions	Responsibility for Leading and Resourcing (if applicable) the Actions	Timeline for addressing Recommendations
1.	Create a formal program board to manage and oversee the CogSci-M and CogSci-GD programs.	A formal board of 7-8 representatives from existing departments should be created.	Chair of Philosophy in consultation with Cog Sci Advisor.	A 5-member program board was formed. It is chaired by Dr. Sam Johnson (Psychology) and includes representatives from Psychology, Philosophy and Computer Science. The board meetings are focused on highlevel strategic issues.
2.	Creation of an upper year undergraduate course for the CogSci-M program that would integrate and consolidate interdisciplinary knowledge in the program. Consideration to be given to structuring the course to be "held with" the existing CogSci 600 course.	Consideration of best way to implement, whether that means structuring CogSci 600 or instead making 447 a required course. Preparing a UGAG submission that includes a series of proposed changes which tentatively include a capstone requirement and also	Chair of Philosophy in consultation with Cog Sci Advisor.	The Executive Committee of the Department of Psychology voted unanimously in favour of these changes on November 12, 2024. These changes will be submitted for review and approval for the next UGAG meeting on Feb 6, 2025.

		address some of the other issues highlighted in the FAR (e.g., difficulty of completing requirements).		
3.	Undertake further discussion with the Graduate Studies Office to bring the TN-GD and CogSci-GD into conformity with the Type Graduate Diploma requirements.	Calendar for Cog-Sci GD requirements has been updated. Further, we will consult with Department Cog Sci Advisor and director of CTN, then Graduate Studies Office for their input and update the TN-GD.	For Cog Sci-GD, Chair of Philosophy in consultation with Cog Sci Advisor. For TN-GD, Director for TN-GD program.	The Calendar has been updated to bring both the CogSci GD and the TNGD into conformity with Type II requirements. The consultations with all parties were completed over the past few years and the Calendar now shows that both GDs conform with the Type II requirements.

The Department Chair/Director, in consultation with the Dean of the Faculty shall be responsible for the Implementation.

Date of next program review 2027-2028

Date

Signatures of Approval

Heather A. Henderson

Sept 13, 2024

Chair/Director Date

AFIW Administrative Dean/Head (*For AFIW programs only*) Date

Sep. 27, 2024

Faculty Dean Date

Note: AFIW programs fall under the Faculty of ARTS; however, the Dean does not have fiscal control nor authority over staffing and administration of the program.

July 31, 2024

Associate Vice-President, Graduate Studies and Postdoctoral Affairs Date
(For graduate and augmented programs)
On Behalf of the Associate Vice-President, Academic