Western UNIVERSITY · CANADA

Integrated Science (WISc)

Final Assessment Report & Implementation Plan

June 2024

Faculty / Affiliated University College	Faculty of Science	
Degrees Offered	B.Sc.	
Date of Last Review	2015-2016	
Modules:	Honours Specialization in Integrated Science with any of: *Astrophysics, Biology, Chemistry, Computer Science, Earth Sciences, Environmental Science, Genetics, Mathematical and Statistical Sciences, Physics, or Synthetic Biology*.	
External Reviewers	Dr. Sarah Symons, School of Interdisciplinary Science McMaster University	Dr. Gabrielle Tompkins, Integrated Science Program, Dalhousie University
Internal Reviewer	Dr. Susan Knabe, Associate Dean, Undergrad. Faculty of Information and Media Studies	Alexandra Agyapong Bachelor of Management and Organizational Studies
Date of Site Visit	February 22 & 23, 2024	
Date Review Report Received	April 2, 2024	
Date Program/Faculty Response Received	Program: May 28, 2024 Faculty: May 28, 2024	
Evaluation	Good Quality	
Approval Dates	SUPR-U: June 26, 2024 ACA: September 4, 2024 Senate (for information):September 13, 2024	
Year of Next Review	2031-2032	
Progress Report	June 2027	

Overview of Western's Cyclical Review Assessment Reporting Process

In accordance with Western's Institutional Quality Assurance Process (IQAP), the Final Assessment Report (FAR) provides a summary of the cyclical review, internal responses, and assessment and evaluation of the Integrated Science (WISc) Program delivered by the Faculty of Science.

This FAR considers the following documents:

- the program's self-study brief;
- the external reviewers' report;
- the response from the Program; and
- the response from the Dean, Faculty of Science.

This FAR identifies the strengths of the program and opportunities for program enhancement and improvement, and details the recommendations of the external reviewers – noting those recommendations to be prioritized for implementation.

The Implementation Plan details the recommendations from the FAR that have been selected for implementation, identifies who is responsible for approving and acting on the recommendations, specifies any action or follow-up that is required, and defines the timeline for completion.

The FAR (including Implementation Plan) is sent for approval through the Senate Subcommittee on Program Review - Undergraduate (SUPR-U) and ACA, then for information to Senate and to the Ontario Universities' Council on Quality Assurance. Subsequently, it is publicly accessible on Western's IQAP website. The FAR is the only document from the undergraduate cyclical review process that is made public; all other documents are confidential to the Integrated Science Program, Faculty of Science, and SUPR-U.

Executive Summary

Western's Integrated Science (WISc) is a four-year, first-entry program with a limited enrollment of 60 students. The program is a vehicle for the delivery of an integrated curriculum through which students learn the fundamentals of various science disciplines, explore the connections between the disciplines, acquire the skills needed to tackle interdisciplinary problems, and refine their transversal skills. The curriculum combines the focused coursework of a traditional Honours Specialization module with a set of new courses under the Integrated Science subject, as well as courses in Philosophy and Project Management. Total program enrolment in 2021-2022 was 126 (across all four years).

The self-study was informed by dedicated surveys and subsequent focus groups with current students and with alumni. Feedback from Community-Engaged Learning (CEL) partners and fourth-year research thesis supervisors was equally collected. These data informed a one-day program retreat to discuss the current state of the program and future directions.

The external reviewers shared a positive assessment of the Integrated Science Program. They offer seven recommendations with considerations for further enhancement.

Strengths and Innovative Features Identified by the Program

- Faculty members have demonstrated passion for undergraduate education and have extensive experience in teaching and learning.
- Small class sizes allow for enhanced innovative teaching and assessment methods, high-impact opportunities for experiential and community-engaged learning; and strong student community.
- Students acquire interdisciplinary expertise that enables them to perform research in various areas and communicate across the sciences.
- As of their first year, students develop skills on how to prepare an oral presentation, how to use Microsoft Excel, how to write a formal lab report, and how to use advanced lab equipment.
- Student feedback indicated that the program provided: 1) unique course experiences; 2) opportunities to develop communication skills; 3) small class sizes with a strong cohort experience; 3) good marketability for the graduates.
- Lower-year students benefit from a number of mentorship activities with upper-year students.
- Teaching laboratory has state-of-the art equipment which enables students to learn modern laboratory skills and perform interdisciplinary experiments.
- Dedicated study/lounge space and a *Living Learning Community* in one of the student residences which allows first-year students in the program to live together.

- Student success in securing scholarships, and pursuing academic careers, gaining employment in science fields, and applicability of skills to work, as seen from the alumni survey.

Concerns and Areas of Improvement Identified and Discussed by the Program

- Increased numbers of students that transfer out of the program after the first year (Approximately 20-25%).
- Difficulties achieving enrollment target of 60 students per year often due to the student dilemma of having to choose between WISc and Medical Science.
- Lack of long-term personnel is detrimental to the consistency and evolution of the program.
- Additional administrative support is required to enable the effective functioning of the program and relieve the Program Director's workload.
- Students noted: 1) areas in need of greater interdisciplinarity in both first year and upper years.; 2) inconsistencies in curriculum and instructors across the years; 3) need for research/internships outside of class; 4) inability to have a dual-degree with Ivey HBA; 5) need for greater balance between biology/ physics/ chemistry.
- Further enhance the Indigenization of 3002A by incorporating more meaningful relationships with Indigenous communities.
- Implement more formal methods for gathering regular student feedback.
- Examine alternatives to Integrated Science 1001X, which has high human resource requirements, low enrolments, and is often seen as insufficient in preparing students for year-2 discipline-specific courses.
- Explore: 1) whether WISc should continue to be a program or be converted to a Minor; 2) combining WISc with Ivey's dual-degree program, which may enhance recruitment and retention; 3) options to allow student transfers at the start of year two.

Review Process

As part of the external review, the review committee, comprising two external reviewers, an internal reviewer and a student reviewer, were provided with Volume I and II of the self-study brief in advance of the scheduled review and then met over two days with the:

- Vice-Provost (Academic Programs)
- Vice-Provost (Academic Planning, Policy and Faculty Relations)
- Director of Academic Quality and Enhancement
- Dean, Faculty of Science
- Associate Dean, Faculty of Science
- Associate University Librarian
- Program Director

- Program Faculty
- Administrative Staff
- Program Students

Following the site visit, the external reviewers submitted a comprehensive report of their findings which was sent to the Program and Dean for review and response. Formative documents, including Volumes I and II of the Self-Study, the External Report, and the Program and Decanal responses form the basis of this Final Assessment Report (FAR) of the Western Integrated Science Program (WISc). The FAR is collated and submitted to SUPR-U by the Internal Reviewer with the support of the Office of Academic Quality and Enhancement.

Summative Assessment – External Reviewers' Report

External reviewers shared that "*WISc can be seen as a value-added honours program. In addition to developing interdisciplinary problem skills, students engage regularly in teamwork, develop their ability to communicate and critically evaluate science both within and outside the university, and consider their role in a supportive and ethically grounded scientific community while developing leadership and mentorship skills."*

Strengths of the Program

- The program team represents a formidable amount of talent, energy, and collegiality that stands the program in excellent stead.
    - Diversity of the teaching team in terms of field and career stage, especially in 1001X, provides a unique opportunity for students to engage with content.
- Tight alignment with the "Towards Western at 150" themes, in particular working toward equity and diversity and to serving public good.
- Curriculum is strengthened by small classes, peer mentorship, a dedicated interdisciplinary teaching team, experiential learning opportunities, a variety of assessment modalities – which all create a thriving learning community.
    - The 2.0 credit course "Exploring Science INTEGSCI 1001X is organized around four central questions and ties together content from seven disciplines (Biology, Calculus, Chemistry, Physics, Earth Science, Astronomy, Computer Science). Students and instructors alike recognize it as the "heart of WISc".
- With a focus on collaborative problem-solving, longer project management experiences, and a suite of experiential learning opportunities, the program provides a portfolio of skills that is well-suited to today's evolving workplace or learning environment.

- Community engaged learning project opportunities allow students to communicate in interdisciplinary teams outside the university setting – reinforcing science communication skills.
- Excellent laboratory and student study space with up-to-date equipment and technology.
- Strengths highlighted by students include: 1) small class sizes; 2) opportunity to explore fields in science in first year before committing to a specialization; 3) exposure to working with other disciplines on policy issues or complex problems.

Prospective Improvements for the Program to Consider

- Protect the interdisciplinary approach of the INTEGSCI 1001X course. Consider ways of reducing teaching load. (*Embedded in Recommendation #1*)
- Overwhelming reliance on limited term instructors, and on instructors whose availability is dependent on their home department's circumstances. (*Embedded in Recommendation #2*)
- The high level of attrition after second year is concerning. (*Embedded in Recommendation #3*)
    - Lack of clarity around the approach to interdisciplinarity.
    - Need for a mechanism for reviewing the student experience longitudinally.
- Broader program promotion, clarification of program information on the WISc website, and formalization of an admission committee could enhance recruitment and enrolment. (Embedded in Recommendation #4)
- Unevenness in instructor's awareness of students' curricular progress through the program. (*Embedded in Recommendations #5*)
- Students noted: 1) frustrations with scheduling, especially night classes; 2) lack of flexibility in INTEGSCI course choice; 3) heavy workload in INTEGSCI. (*Embedded in Recommendation #6*)
- Visions of what the program is and could be differed among stakeholders. Reviewing program objectives with the downstream goal of better articulating the program vision may be helpful. (*Embedded in Recommendation #7)*
- Program administration is under-resourced; for instance some administrative tasks could be handled centrally rather than by faculty members. The Laboratory Supervisor position has been filled by a number of people in the past few years, so stability is low.

Summary of the Reviewers' Recommendations and Program/Faculty Responses

The following are the reviewers' recommendations in the order listed by the external reviewers.

Reviewers' Recommendation	Program/Faculty Response
Recommendation #1: Retain the 1001X course, including the interdisciplinary approaches and team teaching while addressing issues with teaching resources and coding skills.	**Program:** Integrated Science 1001X is being retained with the computer science component being removed; A SOC proposal has been submitted. It should be noted that the 0.5 FCE freed up by the potential removal of Philosophy, which is taught in another faculty, does not lead to any gains within the Faculty of Science. Integrated Science 2002B is being replaced with a choice of three Computer Science courses, as the program recognizes the importance of programming and data-analysis skills. The SOC proposal for this change has also been submitted. **Faculty:** The Faculty of Science supports the program's intention to retain and refine Integrated Science 1001X by removing the computer science component and replacing it with a choice of three existing second-year Computer Science courses as proposed by the Program. Future discussion on efficiency and sustainability should focus on the WISc program as a whole rather than just the 1001X course.
Recommendation #2: Address stability of the teaching team.	**Program:** The stability of the teaching team cannot be addressed by the program alone. This needs to be addressed at the Faculty level, as indicated by the reviewers. The program will defer comments pertaining to this recommendation to the Faculty of Science. **Faculty:** The Faculty agrees with the comment made by the program. Since teaching is assigned by Department Chairs, the stability of the Integrated Science teaching team needs to be collectively maintained by all departments within the Faculty of Science. The Faculty will continue to foster a culture where WISc is recruiting students for the departments, not away from them. See the Faculty-level response to Recommendation #4.

Recommendation #3: Retention. - Strengthen the upper year offerings to include unique and visible activities that Level 1 students look forward to. - Consider more intentional interdisciplinarity in years 3 and 4. - Monitor the student experience in the INTEGSCI courses and maintain and grow the community feeling across the program.	**Program:** • It is important that students in Level 1 be able to see themselves in upper years by strengthening relationships between lower-level and upper-level students (e.g., by further enhancing mentorship activities and exposing lower-level students to research being accomplished by upper-level students). • The Program Director and the Faculty of Science are exploring the possibility of creating either new interdisciplinary courses (which could also be taken by non-WISc students) or cross-listing existing courses such as Geomicrobiology which could be "pick list" options in the various modules. • The program will consider the formation of a "student experience" committee that can monitor student interactions throughout their four years and recommend activities that further foster a community dynamic. **Faculty:** The Dean's Office agrees that the creation of a new second-year integrated course exclusive to WISc students is not a viable option; and encourages exploring new interdisciplinary courses that are open to all Science students.
Recommendation #4: Promotion, recruitment, and admissions - Revise program website - Further Embed WISc within university recruitment work - Provide administrative support for admissions - Establish an admissions committee to review applications and establish and monitor admissions processes and targets.	**Program:** Three new committees were recently formed (in April 2024): a recruitment committee, a web committee, and an admissions committee. The recruitment committee will promote the program to first-year students right at the beginning of September and again in January (students who join in January can take 1000Z the following year). The web committee will focus on correcting/updating the website, keeping it updated with exciting program news, and creating a section on past alumni. The admissions committee will provide administrative support, explore ways to streamline the applications process, and discuss how to implement the suggestions recommended by the reviewers. The Program Director will be an ex-officio member of these committees. - The program Director will discuss recruitment with the Faculty of Science's Assistant Dean of First-Year Studies and with the Office of the Registrar. **Faculty:** The Dean's Office 1) will continue to engage with the University's Communications and Recruitment teams to ensure that WISc is sufficiently promoted; 2) supports the program's commitment to address these issues by establishing dedicated the respective committees. Furthermore, all departments in the Faculty of Science, particularly those with relatively low undergraduate enrolment, should engage with the WISc program's recruitment and admission effort. With a strengthened applicant pool in both number and quality, departments can "hand-pick" applicants into their programs through WISc's supplemental application process.

Recommendation #5: Formation of an instructor's council.	**Program:** The program is highly appreciative of this recommendation. An instructor's council, comprising of all Integrated Science course instructors, has already been formed. The council aims to meet approximately four times a year to share their accomplishments, challenges, and suggestions. **Faculty:** The Dean's Office is pleased to learn that such an instructor council already exists in WISc.
Recommendation #6: Review pre-requisites and consider suggestions for other administrative changes and calendar edits. *(here the reviewers offer a collection of minor edits and prospective administrative changes for consideration)*	**Program:** • INTEGSCI 1001X is officially listed in the prerequisites for over 50 courses that require second-term Calculus, Biology, Physics, or Chemistry. Upper-level INTEGSCI courses are not needed as prerequisites for non-INTEGSCI courses. • A SOC proposal to incorporate Science 3377A/B, Business Administration 2295G, and two other Business Administration courses into a "0.5 from" list for all Integrated Science modules (except the Integrated Science with Synthetic Biology module) has been submitted. • The program Director recently double-checked with Biology (which, in turn, checked with the Office of the Registrar) to be sure that students in an Integrated Science with Biology, Genetics, or Synthetic Biology module would be part of the priority group this coming year. • The program has no issue with students doing a thesis in a department not associated with their main area of concentration, this is already a practice. Moving forward, the program will communicate to students that they can do a project in a different department, provided that they are acceptable to the supervisor/department and meet the project requirements for that department's thesis course. • The Program Director will: 1) discuss with the Faculty of Education the possibility of incorporating a pathway to teacher education; 2) clarify the program's vision and objectives with the recruitment and admissions committee; and 3) explore with the Department of Earth Sciences whether 1001X classes cover some course requirements for Professional Geologist designation. • INTEGSCI 1000Z has now been moved from Tuesday evening to Friday afternoon. **Faculty**: The Dean's Office is supportive of the program's responses and proposed actions where applicable.

Recommendation #7: Identity as Western program	**Program:** The Program Director, together with the recruitment committee and the Dean's Office, will discuss how WISc can develop a unique identity. **Faculty**: With the establishment of the Schmeichel Building for Entrepreneurship and Innovation, new programming will be offered by the Morrissette Institute for Entrepreneurship to students in all faculties. It is unclear if opportunities unique to WISc can be identified at this point. The Faculty acknowledge the potential benefits of having WISc associated as a strong brand of Western and feels that the immediate effort should focus on strengthening the recognition of WISc within the Faculty of Science, in relationship to the response made to Recommendation #4.

Implementation Plan

The Implementation Plan provides a summary of the recommendations that require action and/or follow-up. In each case, the Program Chair, and the Dean of the Faculty are responsible for enacting and monitoring the actions noted in Implementation Plan.

Recommendation	Proposed Action and Follow-up	Responsibility	Timeline
Recommendation #1 Retain the 1001X course, making adjustments to coding, programming and data-analysis content	Monitor the impact of the changes to content related to programming and data-analysis skills. • Revisit as part of mid-cycle progress report.	Program Director	By June 2027
Recommendation #2: Address stability of the teaching team	Ensure that Department Chairs have the Integrated Science teaching team top of mind when planning teaching assignments. • Revisit as part of mid-cycle progress report.	Dean's Office	By June 2027
Recommendation #3: Bolster Retention	• Enhance mentorship activities and expose lower-level students to research being accomplished by upper-level students. • Examine the possibility of creating either new interdisciplinary courses (which could also be taken by non-WISc students) or cross-listing existing courses, such as Geomicrobiology, which could be "pick list" options in the various modules. • Explore the formation of a "student experience" committee that can monitor student interactions throughout their four years and recommend activities that foster a greater sense of community.	Program Director Dean's Office	By Dec 2025
Recommendation #4: Promotion, recruitment, and admissions	Promotion, recruitment, and admissions will be monitored by three newly formed committees: o recruitment committee will promote the program to first-year students right at the beginning of September and again in January. o web committee will focus on correcting/updating the website, keeping it updated with exciting program news, and creating a section on past alumni. o admissions committee will provide administrative support, explore ways to streamline the applications process, and discuss how to implement the suggestions recommended by the reviewers. • Explore central and faculty-level recruitment initiatives; departments with relatively low undergraduate enrolment will be prompted to engage with WISc's supplemental application process.	Program Director Dean's Office	By Sept 2025

Recommendation #5: Formation of an instructor's council.	Monitor the utility and workload of the Council, particularly in light of the other newly formed program committees. • Revisit as part of mid-cycle progress report.	Program Director	By June 2027
Recommendation #6: Review pre-requisites and consider suggestions for other administrative changes and calendar edits	Pre-requisites: o Incorporate Science 3377A/B, Business Administration 2295G, and two other Business Administration courses into a "0.5 from" list for all Integrated Science modules, except the Integrated Science with Synthetic Biology module. • Communicate to students the option of doing a project in a different department, provided that they secure a supervisor and meet the project requirements for that department's thesis course. • Discuss the possible incorporation of a pathway to the teacher education program with the Faculty of Education. • Clarify the program's vision and objectives with the recruitment and admissions committee. • Explore whether 1001X classes cover some course requirements for Professional Geologist designation.	Program Director	By Dec 2025
Recommendation #7 Identity as Western program	• Create opportunities for WISc program members to discuss program identity. As needed, refine and promote WISc's unique identity. • Strengthen the recognition of WISc within the Faculty of Science.	Program Director Dean's Office	By Sept 2025