

# Developing Multiple Accessible Science Transfer Pathways for College and University Students

2016-39

*Final Report*

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## Executive Summary

The project was designed to facilitate an increase in the number of bilateral and bidirectional pathways in Science between York University and Seneca College. The year-long project resulted in the creation of four new articulation pathways and one co-registration agreement which will help to increase student mobility across science programs at York University and Seneca College. The agreements developed were as follows:

### Articulations:

- 1) Advanced Biotechnology diploma (Seneca College) into the Honours, Bachelor of Science in Biology degree (York University).
- 2) Chemical Engineering Technology & Chemical Laboratory Technology – Pharmaceutical diplomas (Seneca College) into the Honours, Bachelor of Science in Chemistry degree.
- 3) Fitness and Health Promotion diploma (Seneca College) into the Honours Bachelor of Science and Honours Bachelor of Arts in Kinesiology degrees (York University).
- 4) Behavioural Sciences diploma (Seneca College) into the Bachelor of Science and Bachelor of Arts in Psychology degrees (York University).

### Co-registration:

- 5) York University Honours Bachelor of Science in Chemistry degree students (3<sup>rd</sup> year) are eligible to take courses in the Chemical Engineering Technology & Chemical Laboratory Technology – Pharmaceutical diploma programs at Seneca College.

The aim of this project was to facilitate access to York University Science programs for Seneca College diploma students and to create opportunities for university graduates in science to pathway into college programs. Additionally, through the Seneca College programs, York University students will have access to experiential learning opportunities.

## List of Partner Institutions

- Seneca College
- York University

## Project Purpose & Goals

Despite the increasing collaboration between York University and Seneca College, there were very few articulated agreements and credit recognition (enhanced block transfer credits) in science between the two institutions. The development of these new science agreements has increased the number of pathways and transfer credits for students engaged in this academic area. The creation of these pathways also provides a replicable model for the system, as the Science programs taught at both York University and Seneca College are offered at many other postsecondary institutions across Ontario.

## Pathways Developed

### *Advanced Biotechnology diploma (Seneca College) to the Honours, Bachelor of Science in Biology (York University).*

The Advanced Biotechnology diploma from Seneca College into the Honours, Bachelor of Science in Biology degree at York University (120 credits) was the first of the four articulation agreements to be developed. Faculty and staff at both institutions were the driving forces behind the development of this agreement. With support from the York Seneca Partnership Office a number of joint meetings were convened between administrators and program coordinators to initiate the agreement. Additionally, input from the credit transfer and assessment offices at both the university and college were solicited, to finalize the logistical arrangements required for implementation of the articulation. The agreement was signed in March 2017 and was subsequently posted to ONTransfer.

To be eligible for admission into the honours degree program, transferring students from Seneca College must have a GPA of 3.3 (75%). Upon transfer into the University, these students would then receive 51 block credits. Therefore, to obtain the Honours, Bachelor of Science degree, transfer students would need to complete a minimum of 69 credits for a total of 120.

University programs have a stronger theoretical focus and the York University Biology program is no exception. The assessment of the science programs offered at the College for credit transfer by program staff at the University, revealed some gaps in the curricula foundational to the University program. The Biology department at the University determined that there was a lack of subject area and vertical coherence between the diploma into the first and second year degree requirements. Therefore, for example, only three credits were granted for the two introductory Biology courses completed at the college (BIO173 and BIO273). Accordingly, to ensure stronger subject matter and foundational preparation for success at the university, under this agreement, transferring students are encouraged to take one first year (BIOL 1001 3.0 - Biology II - Evolution, Ecology, Biodiversity and Conservation Biology) and one second year course (BIOL 2040 3.0 - Genetics) at York University, during the summer months or Winter Semester, prior to seeking admission into the degree. These two York courses are also prerequisites for the year two and three-degree courses, and fill the knowledge gap not addressed in the diploma. Therefore, with the prior completion of these courses, upon being admitted into York University, students can begin in their third-year. The table below outlines the course equivalencies/ waivers granted.

**Table 1.1 Transfer Credits Allocation – Biotechnology Advanced into BSc Biology**

Seneca Courses Biotechnology Advanced Diploma	Seneca Courses Title & Outline	York University Course Waivers Honours Bachelor of Science in Biology Degree	Total Credits
EAC 150 & General Education	<a href="#">College English</a> General Education Courses	Non-Science	6 non-Science
CHM 173 CHM 273	<a href="#">Chemistry</a> <a href="#">Chemistry</a>	CHEM 1000 3.0 Chemical Structure	3 Chemistry
ACA 273	<a href="#">Advanced Computer Applications</a>	EECS 1520 3.0 Computer Use: Fundamentals	3 Computer Science
CHO 373	<a href="#">Chemistry - Organic</a>	CHEM 2020 3.0 Introductory Organic Chemistry I	3 Chemistry
BIO 173 BIO 273	<a href="#">Biology</a> <a href="#">Biology</a>	BIOL 1000 3.0 Biology I - Cells, Molecular Biology and Genetics	3 Biology
BIC 373 BIT 373 BIT 473 SES 391	<a href="#">Biochemistry</a> <a href="#">Biotechniques</a> <a href="#">Biotechniques</a> <a href="#">Effective Technical Writing</a>	BIOL 2020 Biochemistry + BIOL 2070 Research Methods in Cell and Molecular Biology	6 Biology 4 Biology

Seneca Courses Biotechnology Advanced Diploma	Seneca Courses Title & Outline	York University Course Waivers Honours Bachelor of Science in Biology Degree	Total Credits
MOB 673	<a href="#">Molecular Genetics</a>	BIOL 3140 4.0 Advanced Biochemistry and Molecular Genetics Laboratory	
IMU 673	<a href="#">Immunology</a>	BIOL 3120 3.0 Immunobiology	3 Biology
		unspecified	5 Biology
		unspecified	15 Science
**CPY 573	<a href="#">Cell Physiology</a>	BIOL 2021 3.0 Cell Biology and Biochemistry II	

*\*\*students completing the optional CPY 573 will receive BIOL 2021 and 2 unspecified BIOL credits rather than 5 unspecified credits*

***Chemical Engineering Technology & Chemical Laboratory Technology – Pharmaceutical diplomas (Seneca College) into the Honours, Bachelor of Science in Chemistry degree.***

The next agreement developed was the Chemical Engineering Technology & Chemical Laboratory Technology – Pharmaceutical diplomas at Seneca College into the Honours, Bachelor of Science in Chemistry degree at York University. Here again faculty and program staff at both York University and Seneca College were instrumental in the development of this articulation agreement. The successful implementation of the Advanced Biotechnology into the Biology agreement was the primary motivating factor. This Chemistry articulation agreement was signed in August 2017 and has since been posted to ONTransfer.

In this arrangement, students from two Seneca College diploma programs have an opportunity to pathway into the degree program at York University and receive 51 block transfer credits. To obtain the Honours, Bachelor of Science degree, students who transfer from these diploma programs would need to complete a minimum of 69 credits for a total of 120. For admission into the degree, students must have an overall GPA of 3.0 (70%). As well, under the terms of this agreement, transferring students who complete their diplomas will have also satisfied the science admission prerequisites in Mathematics, Biology, Chemistry and Physics, as well as the foundational first year course requirements for the degree.

The Chemistry curricula across the two institutions were highly aligned. However, for this arrangement there were also some gaps identified during the mapping process. Thus for example, the Mathematics and Physics courses completed within the diploma were assessed at the 1500 level at the university. The Chemistry degree program streams at York University have

additional science breadth requirements, outside of Chemistry. Since the 1500 level courses are considered to be high school science equivalents and so are foundational, first year courses in other science breadth subjects (Biology, Math or Physics) will be required for the completion of the Chemistry degree. Additionally, if a transferring student wanted to switch to a science program other than Chemistry or pursue another science major at the University, they would also be required to complete first year courses in these particular subject areas. The table below outlines the course equivalencies/ waivers granted for the Chemistry degree.

**Table 1.2 Transfer Credits Allocation – Chemical Engineering Technology & Chemical Laboratory Technology – Pharmaceutical into BSc Chemistry**

Seneca Courses	Seneca Courses Title & Outline	York University Course Waivers	Total Credits
EAC150 & General Education	<a href="#">College English</a> General Education Courses	Non-Science	6 non-Science
BIO173 & BIO273	<a href="#">Biology</a> <a href="#">Biology</a>	BIOL 1000 3.0 Biology I - Cells, Molecular Biology and Genetics	3 Biology
PHY453	<a href="#">Physics</a>	PHYS 1510 4.0 Introduction to Physics	4 Physics
MTH173	<a href="#">Mathematics</a>	MATH 1510 6.0 Fundamentals of Mathematics	6 Mathematics
MTH273	<a href="#">Mathematics</a>	MATH 1520 3.0 Introduction to Calculus, with Vectors	3 Mathematics
CHM173 & CHM273	<a href="#">Chemistry</a> <a href="#">Chemistry</a>	CHEM 1000 3.0 Chemical Structure	3 Chemistry
CHP633	<a href="#">Physical Chemistry</a>	CHEM 1001 3.0 Chemical Dynamics	3 Chemistry
ACA 273	<a href="#">Advanced Computer Applications</a>	EECS 1520 3.0 Computer Use: Fundamentals	3 Computer Science
CHO353 or CHO333 or CHO373	<a href="#">Chemistry - Organic</a> <a href="#">Chemistry - Organic</a> <a href="#">Chemistry - Organic</a>	CHEM 2020 3.0 Introductory Organic Chemistry I	3 Chemistry
PAC633 and CHO433	<a href="#">Organic Chemistry</a> <a href="#">Chemistry - Organic</a>	CHEM 2021 3.0 Introductory Organic Chemistry II	3 Chemistry

Seneca Courses	Seneca Courses Title & Outline	York University Course Waivers	Total Credits
CHO433 or CHO473	<a href="#">Chemistry - Organic</a> <a href="#">Chemistry - Organic</a>	CHEM 2*** 3.0	3 Chemistry
TAC333 and STA453	<a href="#">Techniques in Analytical Chemistry</a> <a href="#">Statistics</a>	CHEM 2080 4.0 Analytical Chemistry	4 Chemistry
PHT533	<a href="#">Pharmacology and Applied Toxicology</a>	CHEM 2550 3.0 Pharmacology for Health Sciences	3 Chemistry
TAC333 or TAC357 or CMI533 or ECI533	<a href="#">Techniques in Analytical Chemistry</a> <a href="#">Techniques in Analytical Chemistry</a> <a href="#">Chemical Instrumentation</a> <a href="#">Electronics for Chemical Instrumentation</a>	CHEM 3080 4.0 Instrumental Methods of Chemical Analysis	4 Chemistry
PTC633	<a href="#">Polymer Technology</a>	CHEM 3090 3.0 Introduction to Polymer Chemistry	3 Chemistry

***Fitness and Health Promotion diploma at Seneca College to the Honours Bachelor of Science and the Honours Bachelor of Arts in Kinesiology degrees at York University.***

There has been a growing interest by the Faculty of Health at York University in building a stronger collaboration with Seneca College as an academic partner. Opportunities for bi-directional student mobility led to a series of meetings between the Health Faculty and the health and community services program areas at Seneca College. Consequently, this led to the development of a third pathway which will allow students from Fitness and Health diploma program at Seneca College to transfer to the Bachelor of Science or Bachelor of Arts degrees in Kinesiology.

To be eligible for acceptance into the degree, transfer students must have a minimum GPA of a 3.3 (75%). The agreement is being finalized and will be posted to ONTransfer in Winter 2018. The block credit allocation given to transferring students interested in pursuing either the Bachelor of Science (BSc) or Bachelor of Arts (BA) are the same – 45 credits. Transferring students will then be required to complete a minimum of 75 credits to obtain the 120-credit honours degree.

York University will admit students into the science stream of the degree, providing that they had a previous background in science. Therefore, a provision was made in the articulation agreement to allow Fitness and Health diploma students' admittance into the BSc if they had some of the required high school science credits (Math 12U or SBI4U or SCH4U or SPHAU). However, these students would have to take the required science courses within their first year (that is within the first 24 credits taken) when enrolled at York University.

Additionally, the BSc in Kinesiology has Math course requirements. Since there are no Mathematics courses offered within the Seneca College Fitness and Health diploma, transferring students are also required to complete SC/Math 1510.6.0, during their first year at York University. However, through this agreement, Seneca College transfer students who have completed the diploma will be considered to have met the Biology course requirement for admission. Having a science foundation is critical for transfer students who want to pathway and be successful in the BSc degree in Kinesiology. Potentially, these requirements may have future implications for the college program review process.

The assessment of this college curriculum did not map specific diploma credits to courses within the degree. Instead, as outlined in Table 1.3, with the completion of the diploma, transferring students will receive a block of 45 credits, most of which are specified credits. As well, these specified credits were granted for courses across years one through four of the degree. Therefore, the articulation agreement will outline the remaining degree requirements, to support the advising of students interested in transferring to the Bachelor of Science (BSc) or Bachelor of Arts (BA) degrees in Kinesiology.

**Table 1.3 Transfer Credits Allocation – Fitness & Health Promotion Diploma into to Honours Bachelor of Science or Honours Bachelor of Arts in Kinesiology degrees**

Seneca Courses	York University Course Waivers	Total Credits
Seneca College Fitness and Health Promotion program diploma courses	KINE 1020 6.00 Fitness & Health	6 Kinesiology
	KINE 2011 3.00 Human Physiology I	3 Kinesiology
	KINE 3020 3.00 Skilled Performance and Motor Learning	3 Kinesiology
	KINE 3030 3.00 Biomechanics of Human Movement	3 Kinesiology
	KINE 3345 3.00 Adapted Physical Activity	3 Kinesiology
	KINE 4020 3.00 Human Nutrition	3 Kinesiology

Seneca Courses	York University Course Waivers	Total Credits
	3 PKIN courses	9 Practicum Credits
	12 General Education Credits	12 Credits

***Behavioural Sciences diploma at Seneca College to the Bachelor of Science and the Bachelor of Arts in Psychology degrees at York University.***

The Behavioural Sciences diploma (Seneca College) into the Bachelor of Science and the Bachelor of Arts in Psychology degrees (York University), articulation, is another successful arrangement developed by the Faculty of Health and the Faculty of Applied Arts and Health Sciences. As part of this agreement students will receive 42 block credits when they transfer, requiring the completion of an additional 78 credits to obtain the honours degree. To be eligible for transfer into the degree, students must have a minimum GPA of 3.0(70%).

Similar to the Kinesiology admission requirements, for this pathway, Seneca College students who do not have the Math or Chemistry or Physics needed for the Bachelor of Science in Psychology degree, may be admitted providing that they have a previous background in science. That is, for example, a transferring student may be admitted to the science stream having previously earned at least one of the science prerequisite courses at the high school or postsecondary level. However, all foundational science courses must be completed within their first year at York University.

Gaps were also identified in the diploma curricula for successful transition into the degree. As such, a stipulation was made in the articulation agreement that diploma completion was to be a condition for granting credit in some of the core and year-long Psychology courses in the degree. (See Table 1.4 - PSYC 1010 6.0 and PSYC 22\*\* 3.0). Additionally, at present this College diploma program has no science course offerings specified for students who may want to opt to pursue the BSc. One future implication is that student advising could encourage students with an interest in transferring to BSc programs, to obtain the required science courses at the College through the general education diploma offerings.

The agreement between York University's Glendon Campus and Seneca College was completed in June 2017 and posted to ONTransfer. As well, a separate agreement is being finalized for the Keele Campus with the goal of posting to ONTransfer early in Winter 2018. The latter articulation will be in effect for students starting programs at York University in the Fall 2018 semester.

**Table 1.4 Transfer Credits Allocation – Behavioural Sciences diploma into the Bachelor of Science and the Bachelor of Arts in Psychology degrees**

Seneca Courses	York University Course Waivers	Total Credits
SWL206 <a href="#">Human Development for Social Service Professionals</a>	PSYC 2110 3.0 Developmental Psychology	3 Psychology
PSY206 <a href="#">Personality and Abnormal Behaviour</a>	PSYC 3140 3.0 Abnormal Psychology	3 Psychology
BHS303 <a href="#">Forensics, Crime and Corrections</a>	PSYC 3310 3.0 Psychology and Law	3 Psychology
PSY100 <a href="#">Introduction to Psychology</a>	PSYC 1010 6.0 Introduction to Psychology (PSYC 1010 6.0 is a full year course. Therefore, students must complete the Behavioural Sciences Diploma to obtain a waiver for PSYC 1010 6.0).	6 Psychology
BHS201 Introduction to ABA II: Techniques and Applications	PSYC 22**3.0 (Students must complete the Behavioural Sciences Diploma to satisfy the three credits from Group 2, as described in the Psychology requirements in the York University academic calendar).	3 Psychology
	12 General Education Credits	12 Credits

***Chemistry Co-registration.***

Since developing the Biology and Chemistry articulation agreements, the Faculty of Science (York University) and the Faculty of Applied Science and Engineering Technology (Seneca College) wanted to explore other mobility opportunities for students. This led to discussions and the emergence of a pathway that would allow York University students to take courses in Seneca College diploma programs while remaining in their degree. York University Honours Bachelor of Science in Chemistry degree students in their 3<sup>rd</sup> year are eligible to take select courses in the Chemical Engineering Technology & Chemical Laboratory Technology – Pharmaceutical diploma programs at Seneca College.

This agreement differs from articulation pathways as there is also a financial arrangement needed and a process crafted for managing the student mobility. The agreement, academic and financial arrangements were finalized in an MOU between York University and Seneca College in November 2017.

To be eligible to participate, Honours Bachelor of Science degree students in Chemistry must have completed 54 credits (be in the 3<sup>rd</sup> year of their program). Under the terms of this co-registration agreement students have the option of enrolling in a minimum of two courses and a maximum of five courses in one semester at the College, while in their degree program. Following an assessment of the curricula, students can select from ten approved courses in two Seneca College diploma programs, namely the Chemical Engineering Technology & Chemical Laboratory Technology – Pharmaceutical programs. Upon completion students will receive a letter grade calculated into the overall GPA at York University. However, these courses will not be included in the GPA calculation for the Major.

Another benefit of this arrangement is that transfer credit would be granted to students who pursue a dual credential, by enrolling in one of the above diplomas after completing their York University degree. Students who choose to enroll in the Seneca College diploma will receive advanced standing.

Through this co-registration agreement York University students would also obtain ‘hands on’ experience in instrumentation to develop their skills in laboratory techniques and good manufacturing practice. The agreement has been signed and the project will be implemented in Winter 2018.

### **Promising Practice and Lessons Learned**

To achieve the goals of this project and to support student transfer initiatives between York University and Seneca College, there were joint meetings held in 2016 & 2017 between colleagues in the college and university programs where there was high affinity. These meetings offered opportunities to broaden the understanding of curricula at both institutions. The faculty were able to delve into curriculum beyond the written documentation typically exchanged for the assessment of transfer credit possibilities. Consequently, in some iterations of the articulation agreement it was not possible to identify specific one to one credit. Instead, a group of courses within a degree were identified as being satisfied because of diploma completion. (See Table 1.3).

During this project, as has been discussed above, some gaps were also identified between the University and College curricula in Science. However, efforts were made to bridge the gap, in some instances. For example, in the Biotechnology to Biology articulation, conditional admittance was granted for potential students to take degree courses while they were still enrolled in their diploma program. As was also previously discussed, in some of the diploma to

degree pathways, science courses were either not offered or were assessed as foundational (high school equivalencies). As a result, some participants in the project expressed the need for a common first year in science programs across the Ontario postsecondary system. Finally, the multiple types of arrangements developed will support students' employability post-graduation, and diversify their learning experiences at both types of institutions.