

Pathways to B.Sc. Biology: Challenges and potential solutions

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Outline

- Algoma's Biology program
 - Program map and learning outcomes
- Challenges to pathway creation
 - Introductory material coverage
 - Insufficient course overlap
- Solutions
 - Combining courses to create equivalencies
 - Cross-year transfer credits (a hybrid approach)
 - Examples
- Discussion/Questions



B.Sc. Biology Program

- Program level learning outcomes:
 1. Key concepts and theories in biology
 2. Explore the current state of knowledge and investigate innovative solutions using an integrative approach
 3. Apply knowledge of the theory, principles, and concepts in an integrative manner
 4. Understand/analyze complex issues by applying scientific data trans-disciplinarily



B.Sc. Biology Program

- Program level learning outcomes:
 5. Generate novel research questions/hypotheses, collect/analyze data, and formulate/defend conclusions with rigorous scientific methodology
 6. Think critically with respect to science and technology-based decision making
 7. Communicate scientific information effectively
 8. Participate in collegial peer review processes



B.Sc. Biology Program

- Program level learning outcomes:
 9. Contribute as effective team members in multidisciplinary research teams
 10. Apply practical laboratory and field sampling skills
 11. Apply numerical skills to the analysis of data
 12. Work collaboratively to critically evaluate, and investigate possible solutions to biological challenges relevant to the Algoma region



B.Sc. Biology Program

- Year 1:
 1. Biology I and II
 2. Chemistry I and II
 3. Physics I and II OR Geology I and II
 4. Calculus I and Calculus II OR Linear Algebra
 5. Two Humanities/Social Sciences electives



B.Sc. Biology Program

- Year 2:
 1. Statistics
 2. Cell Biology
 3. Microbiology
 4. Principles of Scientific Inquiry
 5. Two of three Form and Function
 - Plants, Invertebrates, Vertebrates
 6. Organic Chemistry
 7. One 2nd year Biology credit
 8. Two Humanities/Social Sciences electives



B.Sc. Biology Program

- Year 3:
 1. Research Methods and Analysis
 2. Genetics
 3. Evolution
 4. Population Ecology and Community Ecology
 5. Biochemistry
 6. Two 3rd year Biology electives
 7. Two free electives



B.Sc. Biology Program

- Year 4:
 1. Honours thesis (two course equivalent)
 2. Six 3rd or 4th year Biology electives
(at least 3 at the 4th year)
 3. Two free electives



B.Sc. Biology Program

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Transfer Pathway Challenges – Breadth of Coverage Challenge

Year 1:

1. Biology I and II
2. Chemistry I and II
3. Physics I and II OR Geology I and II
4. Calculus I and II OR Linear Algebra
5. Two Humanities/Social Sciences electives

Year 2:

1. Statistics
2. Cell Biology
3. Microbiology
4. Principles of Scientific Inquiry
5. Two of three Form and Function
6. Organic Chemistry
7. One 2nd year Biology credit
8. Two Humanities/Social Sciences electives



Transfer Pathway Challenges: Building on Principles

Year 1:

1. Biology I and II

Year 2-4:

1. Cell Biology
2. Microbiology
3. 2 of 3 Form and Function
4. Genetics
5. Evolution
6. Population Ecology
7. Community Ecology
8. Many 2nd-4th year electives



Transfer Pathway Challenges: Building on Principles

Year 1:

1. Chemistry I and II
2. Calculus I

Year 2-3:

1. Organic Chemistry
2. Biochemistry



Challenges to Pathway Creation

- No directly equivalent courses
- No obvious first year equivalents or coverage of material across courses
- Variation in credit hours
- Program learning outcomes incomplete



Sault College Programs

- A number of programs with biological content
 - Fish and Wildlife Technician
 - Natural Environment Technician or Technologist
 - Adventure Recreation and Parks
 - Forest Conservation
 - Fitness and Health Promotion
 - Practical Nursing
 - OT/PT Assistant



Typical Pathway

- Students registering for 4-year degrees (40 courses) are eligible for up to:
 - 15 courses for 2 year programs
 - 20 courses for 3 year programs
- Often only the electives can be filled by these transfer credits as it stands
 - For Biology, this means only the eight elective courses are filled by transfer credits
 - Credit may be given for program electives but on case by case basis and there is a need for consistency



Proposed Solutions

- Rather than single course-course transfer use pairs of courses
 - Related in content
 - With sufficient biological content
 - Assign to program-level electives based on:
 - Year-level in program
 - Number of combined courses
 - Content related to Biology electives in our program



Example: Forest Conservation

- **2nd Year Biology Elective**
 - Silviculture I
 - Silviculture II
 - Forest Plant Biology
- **3rd Year Biology Electives**
 1. Natural Resource Entrepreneurship
Sustainable Res Management
 2. Fire Management
Wildlife Management
Forest Management Planning
 3. Ecology
Ecosystem Classification



Example: Forest Conservation

- **4th Year Biology Elective**

- Fall Field Camp – First Year
- Fall Parks and Rec Camp – 2nd Year
- Trees and Shrubs Identification
- Trees and Herbaceous Plant Identification
- Soils Analysis
- Forest Inventory

***anti-requisite Field Studies in Biology (4th year elective)**



Example: Forest Conservation

- Credits not allocated toward specific Biology program courses
 - Identified as either free electives or Humanities and Social Sciences electives depending on discipline
 - Eight elective courses transferred



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 - 6. Two 3rd year Biology electives**
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B.Sc. Biology Program

- Year 4:
 1. Honours thesis (full year course)
 2. Six 3rd or 4th Year Biology electives (at least 3 at 4th year level) – **2 of 6**
 - 3. Two free electives**



Example: Forest Conservation

- Transfer pathway:
 - 8 courses of free elective (all that are required for the B.Sc. in Biology at Algoma)
 - One 2nd year Biology elective
 - Three 3rd year Biology electives
 - One 4th year Biology elective
- 13 of the required 40 courses; the remaining 27 courses could be obtained in 3 years of study at Algoma (under 10 courses per year).



Example 2 – Dental Hygiene (Cambrian College) – Year 2

- **Introduction to Statistics**
 - Introduction to Statistics and Research Methods
 - Evidence-based Practice
 - Research and Writing/Health Sciences
- **2nd Year Biology Elective**
 - Dental Radiography
 - Pharmacology in Dental Hygiene
- **Microbiology**
 - Microbiology/Immunology
 - Periodontics



Example 2 – Dental Hygiene (Cambrian College) – Year 3

- **Human Form and Function I**
 - Anatomy and Physiology
 - Orofacial Anatomy
- **Human Form and Function II**
 - Anatomy and Physiology II
 - Human Pathophysiology



Example 2 – Dental Hygiene (Cambrian College) – Year 4

- **BIOL 3rd Year Elective**
 - Promoting Health in Multicultural Populations
 - Health Promotion and Community
 - Community Health
- **BIOL 3rd Year Elective**
 - Oral Histology
 - Oral Pathology
- **BIOL 3rd Year Elective**
 - Oral Health Promotion
 - Nutrition in Health Promotion
 - Health Policy and Advocacy
- **BIOL 4th Year Elective**
 - Dental Hygiene Theory I - V



Example: Dental Hygiene

- Transfer pathway:
 - Eight free elective courses (all that are required for the B.Sc. in Biology at Algoma)
 - Core courses: Microbiology, Statistics
 - One 2nd year Biology elective
 - Five 3rd year Biology electives
 - One 4th year Biology elective
- 17 of the required 40 courses transferred; the remaining 23 courses could be obtained in 2.5 years of study at Algoma



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B.Sc. Biology Program

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 2. Six 3rd or 4th year Biology courses (at least 3 at 4th year level) – **4 of 6 (3x 3rd and 1x4th)**
 - 3. Two free electives**

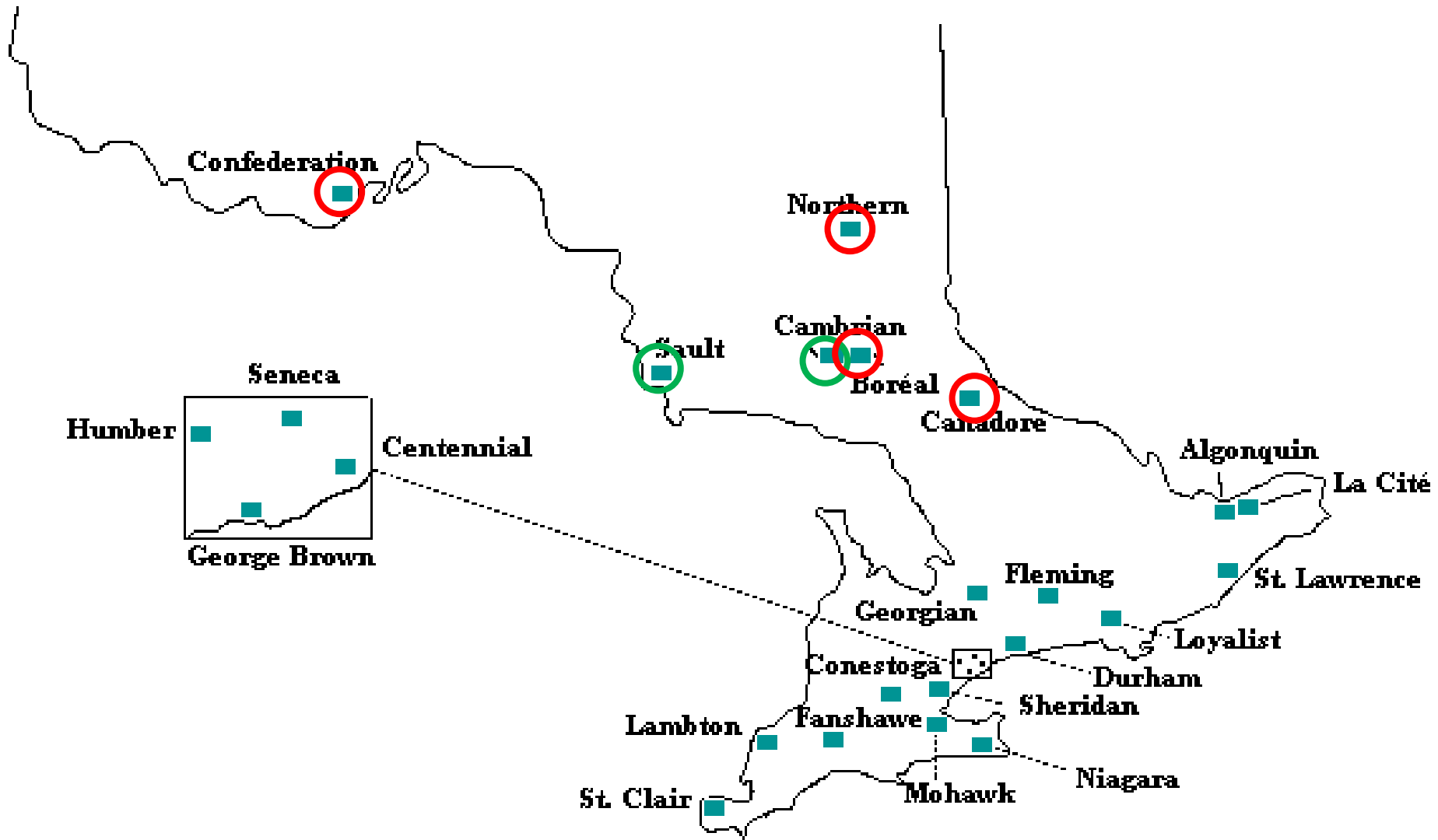


Preserving Program Outcomes

- Core courses only given as credit when sufficient coverage in program
 - All students exposed to breadth of material
- Cross-year credit transfer allows students to build toward program learning outcomes
 - Students take some courses in each of years 1-4
 - Introductory courses ensure foundational knowledge covered



Next Steps



Ideas for Discussion

- How do others build Science pathways?
 - Bridging courses?
 - Full-year transfers (e.g. 2+2)
- How do different pathway types influence student success?
 - Will hybrid pathways differ?
- Is taking a program by program approach time effective?
- How will cross-year transfer credits affect course scheduling for programs?

