

# Post-secondary mathematics education in Quebec: a view of the CEGEP educational level

Bernard R. Hodgson

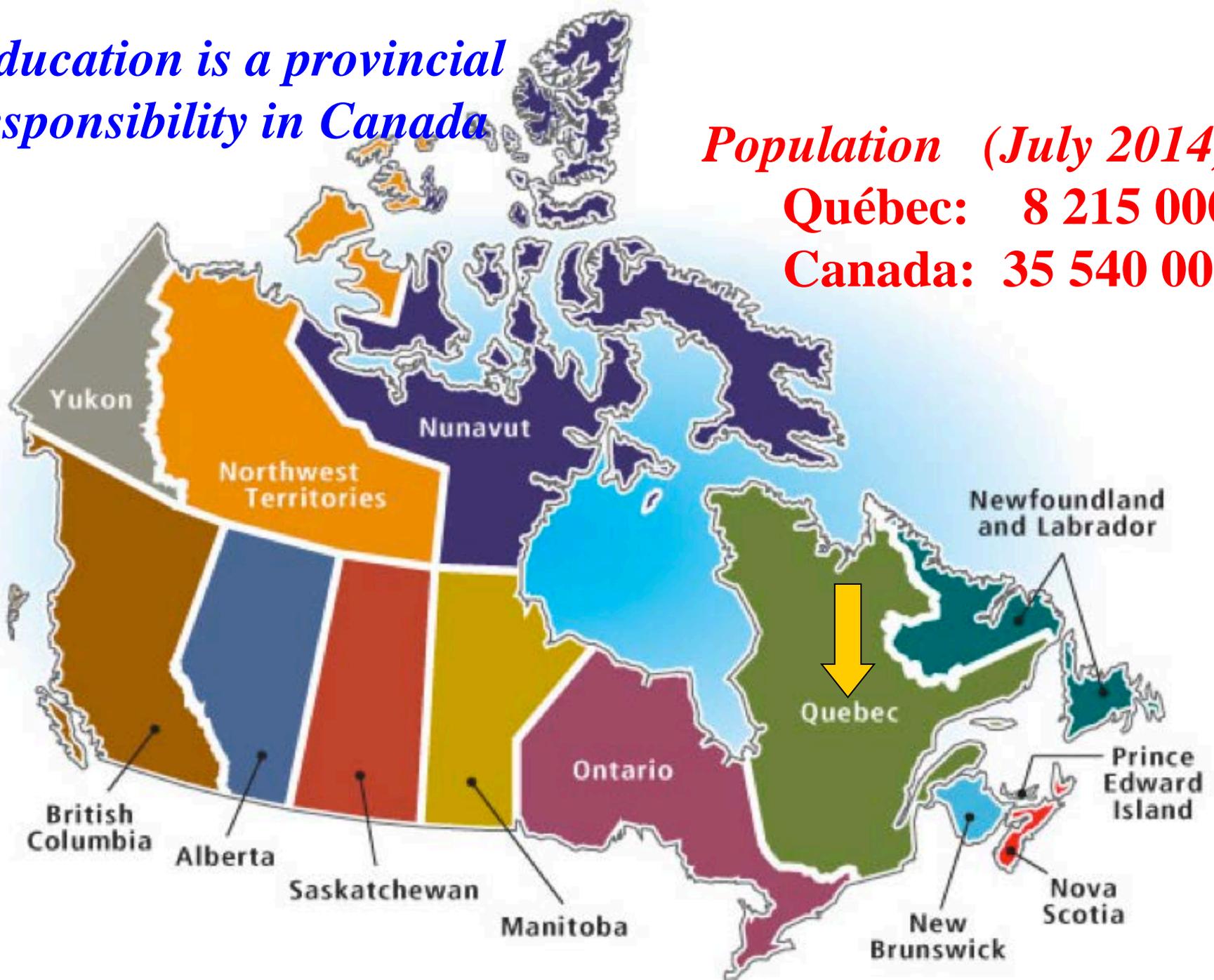
Département de mathématiques et de statistique  
Université Laval, Québec, Canada

*Education is a provincial responsibility in Canada*

*Population (July 2014)*

**Québec: 8 215 000**

**Canada: 35 540 000**



“CEGEP” is a French acronym

*“Collège d’enseignement général et professionnel”*

**General and Vocational College**

*“cégep” — now accepted as a bona fide noun*

*“cégépien” = CEGEP student*

CEGEPs belong to ISCED level 4 —

“Post-secondary non-tertiary education”

An instance of “an institution that straddles the divide between secondary education and tertiary education”

*(World Bank)*

UNESCO International Standard Classification  
of Education (ISCED 2011)



Faculté des sciences et de génie

# Structure of the educational system (province of Québec)

**AGE 5 – 11**                      *Primary school (K + 6)*

**AGE 12 – 16**                      *Secondary school (5!!!)*

**AGE 17 – 18 / 19**                      *CEGEP (2 / 3)*

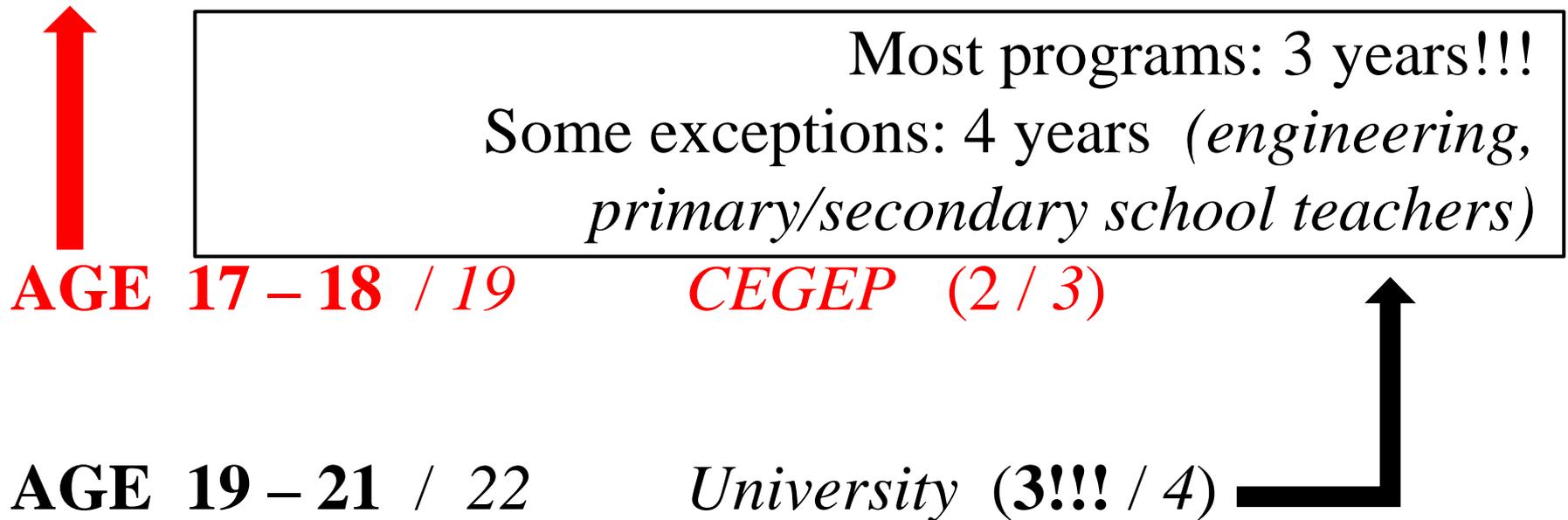
**AGE 19 – 21 / 22**                      *University (3!!! / 4)*

Age as of September — start of schoolyear

# Structure of the educational system (province of Québec)

Pre-University programs: 2 years  
Technical programs: 3 years

*CEGEP network  
throughout Québec  
(launched in 1967)*



Age as of September — start of schoolyear

# PLAN OF MY PRESENTATION

A multiple perspective on the CEGEP:

- a historical perspective
- a systemic perspective
- a student perspective
- a teacher perspective
- a mathematical perspective
- a personal perspective

**OF COURSE my aim today IS NOT**

*to “export” the CEGEP model...*

*interest for some of you to hear of this peculiar system*

- while far from “perfect”, the CEGEP has definitely shown its merits and impacted very positively on education in Quebec over the last fifty years

**OF COURSE my aim today IS NOT**

*to “export” the “CEGEP model”...*

*interest for some of you to hear of this peculiar system*

- some *similarities* with the community college model
  - presence among small communities
  - increased role as a pathway to 4Y colleges
- but substantial *differences* — the CEGEP system is *the only possible path* in Quebec to higher ed

# I- A historical perspective

1960s – period of intense changes in Quebec

## Quebec's “*Quiet Revolution*”

*a multifaceted phenomenon — secularization of society*

influence / control of the Roman Catholic Church on health (*hospitals*) and **education** — this phenomenon was especially true among the French-speaking community

1961-1966 ***Royal Commission of Inquiry on Education in the Province of Quebec*** “Parent Commission”

Mandate: • *democratization of education*  
• *search for quality education*

*Chair:*

Monsignor Alphonse-Marie Parent



# Parent Report — 5 volumes (1963–1965)

Complete rethinking of the Quebec's education system —  
in particular: *creation of the CEGEP system*

*“The Parent Report  
has incarnated two  
aspirations of  
Quebec in his days:  
entry into modernity  
and secularization  
of society.”*

(Guy Rocher)

Parent  
Commission



# Before the Parent Report

Many weaknesses in education in Quebec

(and especially among the Francophone community)

- 1950: average number of schooling years  $< 8$   
average age of full school attendance  $< 12$
- substantial progress from 1950 to 1961 — but still low

*level of schooling of Quebec Francophones much lower than in Ontario or USA*

*(better results among Anglophone community)*

Âge	1950	1961
12	95,0	100,0
13	75,0	100,0
14	57,0	99,3
15	35,0	88,0
16	16,5	55,5
17	11,5	34,0
18		17,7

*Rate of school attendance*

# Before the Parent Report (*cont'd*)

- upper secondary education for *Francophones* split up
  - source of confusion for pupils
  - lack of vision / division into “knowledge universes”  
(*scientific, commercial, general, technical, “classical”*)



- *classical colleges* — preparation of the “elite”  
based on a French model (16th century)  
brought to Quebec by Jesuits (1635)  
  
centered on humanities  
(French, Latin, Greek, Philosophy)

The main (almost only) entry door to university!!!

*Most classical colleges were private  
and belonged to religious orders*



# Before the Parent Report (*cont'd*)

Difficulty of access to higher education (*1964-65 data*)

## *Primary course*

boys	477 372	
girls	445 823	<b>923 195</b>

## *Secondary course*

boys	153 404	
girls	162 864	<b>316 268</b>

## *Classical course*

boys	30 113	
girls	10 832	<b>40 945</b>

*University students:*

M 42 565

F 21 878

**64 443**

*Population of Québec:*

*approx. 5 500 000*



# “Underlying philosophy” of the Parent Report

- The classical course can no more be proposed / imposed as the unique intellectual and moral model to prepare the leaders of tomorrow’s society  
    too “narrow” — both in its content and its population
- Besides philosophical and literary bodies of knowledge, there is also a body of scientific knowledge —  
    importance of providing wide access to scientific culture,  
    the rigor of its method and its rationality
- This renewed vision of the educative mission is essential in relation to the *democratization* of education
  - education must address more varied needs  
    *an increased need for specialization*

-- “*mass education*”



# Recommendations of the Parent Report (*main*)

- establishment of the Quebec Ministry of Education
- compulsory schooling up to age 16
- new framework for primary & secondary education
  - primary: *6 years*
  - secondary: *5 years!!!* — “polyvalent” school replaces multiplicity of secondary institutions
- reform of technical and vocational education
- *creation of the CEGEPs — two streams / no tuition fees*
- transfer of teacher education (for the primary & secondary levels) to universities — instead of normal schools

- promoting access “for all” to university education



# Follow-up to the Parent Report (*CEGEP*)

- 1967: adoption of the law establishing the CEGEPs
- launching of the first CEGEPs:
  - 1967: 12
  - 1968: 23
  - 1971: 39
  - 1980: 45
- nowadays: a network of 48 institutions

From times to times, voices within Québec: “Let’s close the CEGEP network and be like the rest of North America”  
Global reaction: ***NO!***

\* financial disaster —

\* ***the CEGEP system works well!!!***



## II- A systemic perspective

### Structure of the Quebec educational system

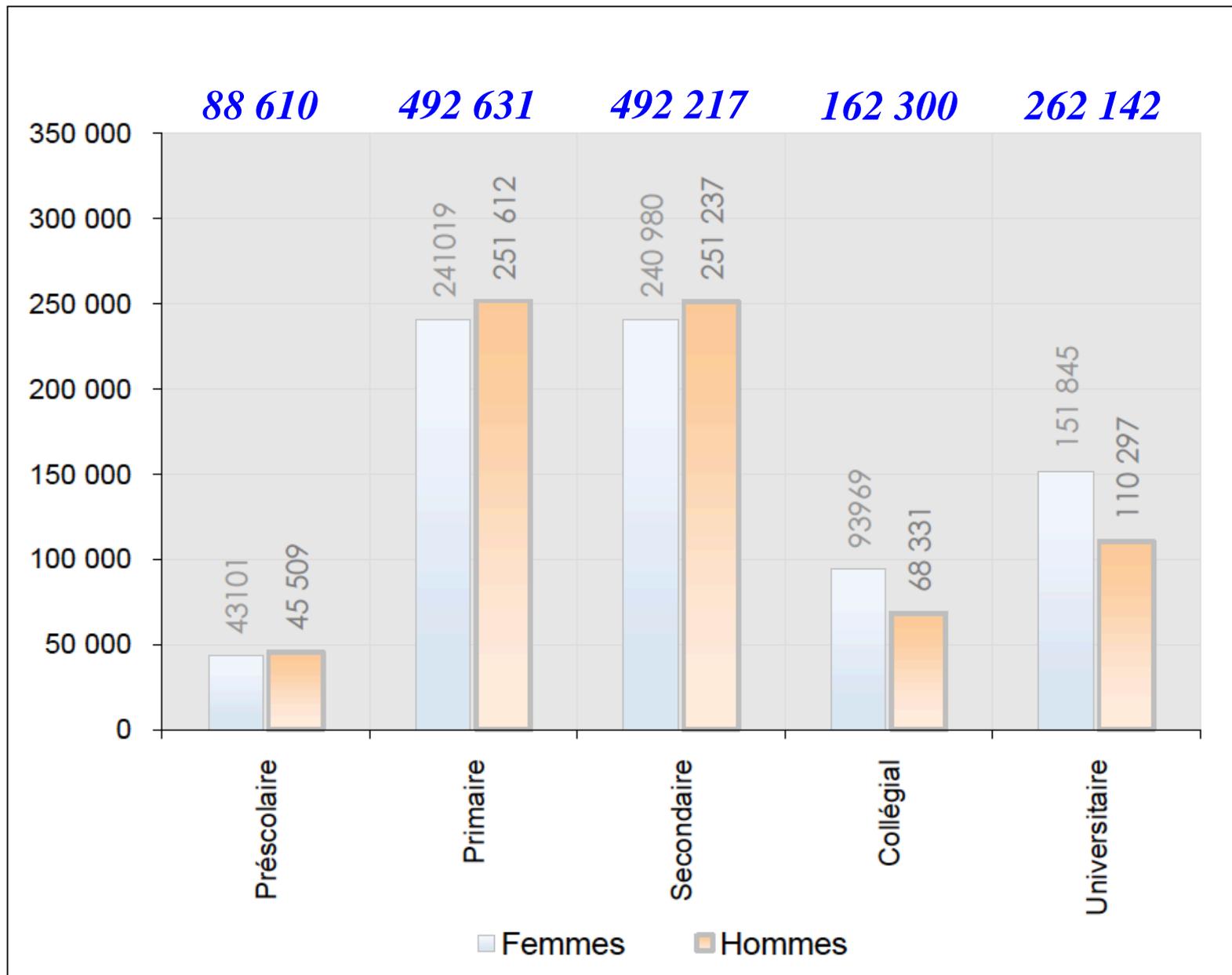
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**AGE 17 – 18 / 19**                      *CEGEP (2 / 3)*  
Pre-University programs: 2 years  
Technical programs: 3 years

**AGE 19 – 21 / 22**                      *University (3 / 4)*

Figure 1 : Répartition des effectifs scolaires au Québec, 2006-2007





# Free public network of CEGEPs

48 institutions — 178 546 students (Sept. 2014)

- globally: 50% PreUniv — 50% Technical  
but this may vary considerably both ways  
from one CEGEP to the other (20% / 80%)
- 58% women — 42% men (*recent increase of men*)

an important continuous education role

presence of CEGEPs in smaller cities (even < 15 000)

major local impact for the city (cultural / socioeconomic)  
as well as for students and their families

# Pre-university and Technical streams

- 9 pre-university programs
  - *natural sciences*
  - *social sciences*
  - visual arts, etc.
- 130 technical (vocational) programs (*5 large families*)
  - *nursing*
  - *accounting and management technology*
  - specialized education (vg hearing impaired)
  - community recreation leadership
  - industrial electronics, etc.

A beginning of *specialization!*

but still some flexibility for adjustments



# Pre-university and Technical streams (*cont'd*)

- both types of programs share a common *general education* component — courses in:
  - mother tongue and literature (French or English) – 4
  - second language (English or French) – 2
  - philosophy – 3
  - physical education – 3
  - complementary courses – 2

promotion of general culture for all — not only the university-oriented students  
students of both streams meet in these general courses

- each program (Pre-U or Tech) also has a substantial *specific education* component

*comments on the maths content later*

# Distribution of responsibilities

## Ministry of Education

- identifies the *competencies* to be mastered by students and *criteria* for having reached these competencies

## Each CEGEP (via its Study Commission)

- provides a local interpretation of the Ministry's expectations (“master plan”)

## Each teacher

- prepares a detailed course syllabus (“contract” with the students) – approved by his/her Department

*No evaluation of students by the Ministry*

Substantial *pedagogical* autonomy

But somewhat limited *financial* autonomy



### III- A student perspective

The CEGEP as a “*student-centered*” institution

- 2 / 3 years for a smooth(?) transition towards more advanced education or workplace
  - “pupils” become gradually “students” through this first level of higher education
- relationship students / teachers
  - small groups (one aspect for an easier secondary/CEGEP *transition*)
  - teachers are “full-time” educators — more accessible, greater implication in pedagogical issues than typical university profs

*3 out of 4 are “1<sup>st</sup>-generation” students  
and 65% obtain their diploma*



### III- A student perspective (*cont'd*)

- CEGEPs are regional structures
  - less stressing than “large cities”, less expensive
- beginning of specialization, but at a slow pace
  - much easier to correct “wrong” choices / less impact (vg financial, time) — *1/3 students graduate in a program different from their original choice*
- “DEC-BAC” — possibility for a shorter path from some Technical CEGEP program to a University program (altogether one year less)

*“Warming up” effect motivating higher studies by students— as opposed to “cooling down” effect sometimes attached to community colleges*

### III- A student perspective (*cont'd*)

*Smooth transition towards “adulthood”*

*at a moment most timely on a personal level as a human being*

passage opportunity between a much controlled setting (secondary school) to a setting with no control (university) — for most students, it works pretty well

## IV- A teacher perspective

CEGEP teachers are prepared as discipline specialists

- minimal requirement (in theory): bachelor degree!!!
- in practice: most CEGEP teachers have *in addition* either a master degree in the discipline, or an education degree, or both  
some — but few — PhDs, either in the discipline or in education
- frustration with the decline in recent years in the total number of math courses offered (*Technical stream*)

## IV- A teacher perspective (*cont'd*)

- challenge (for some): teaching to Technical students!
- pedagogical reality: students are highly occupied outside their courses
- encouraged to be involved in pedagogical innovation
- team work is very frequent — and encouraged

# V- A mathematical perspective

I am using information found on the website of one (English) CEGEP in Montréal — *but this info is pretty standard*

possible difference in math: ordering of the courses  
(vg *Linear Algebra* before *Calculus* — or vice versa)

*NB: Dawson College: 8159 students — 69,5% PreUniv*

The image shows a screenshot of the Dawson College website homepage. At the top, there is a navigation bar with the following menu items: ABOUT DAWSON, PROGRAMS, CONTINUING EDUCATION, SERVICES, OUR COMMUNITIES, and INFO DESK. Below the navigation bar is a banner area featuring the Dawson College logo on the left and the word "DISCOVER" in large, spaced-out letters on the right. The main content area is dominated by a large photograph of a diverse group of students in blue graduation gowns, smiling and celebrating. A blue overlay box in the bottom right corner of the photo contains the text "THIS IS THE PLACE" and "WATCH THE VIDEO". To the right of the main content area, there is a sidebar with the "MY DAWSON" logo, a "Click to login" link, the date "Fri October 17, 2014", a "Dawson Site Map" link, a Google search bar with a "SEARCH" button, a "Quick Links" dropdown menu, and a "Follow Dawson College" section with links to Facebook, Twitter, and Instagram. A "Home" button is visible in the bottom left corner of the page.

# Mathematics



Home Programs Disciplines Mathematics Course List

## Course List

Course Number	Course Name	C - L - H	Hrs
201-000-FC	First Choice Seminar		0
201-013-50	Remedial Activities for Secondary IV Mathematics: Technical and Scientific Option	2 - 2 - 2	60
201-015-50	Remedial Activities for Secondary V Mathematics: Technical and Scientific Option	4 - 2 - 4	90
201-016-50	Remedial Activities for Secondary IV Mathematics: Technical and Scientific Option	2 - 3 - 3	75
201-103-DW	Calculus I	3 - 2 - 3	75
201-105-DW	Linear Algebra	3 - 2 - 3	75
201-203-DW	Calculus II	3 - 2 - 3	75
201-257-DW	Mathematics - Statistics for Computer Science	3 - 2 - 3	75
201-401-DW	Statistics for Social Science	2 - 1 - 3	45
201-801-DW	Business Mathematics	2 - 1 - 3	45
201-811-DW	Intro to Applied Mathematics	4 - 2 - 4	90
201-912-DW	Introduction to Applied Mathematics	4 - 2 - 4	90
201-922-DW	Introduction to Statistical Methods	2 - 1 - 1	45
201-923-DW	Applied Mathematics	2 - 1 - 2	45
201-935-DW	Business Statistics	2 - 2 - 2	60
201-941-DW	Engineering Mathematics I	2 - 2 - 2	60
201-942-DW	Engineering Mathematics II	2 - 3 - 2	75
201-943-DW	Applied Math	3 - 2 - 3	75
201-BZF-05	Calculus III	3 - 2 - 3	75
201-BZS-05	Probability and Statistics	3 - 2 - 3	75
201-NYA-05	Calculus I	3 - 2 - 3	75
201-NYB-05	Calculus II	3 - 2 - 3	75
201-NYC-05	Linear Algebra	3 - 2 - 3	75

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201-015-50	Remedial Activities for Secondary V Mathematics: Technical and Scientific Option	4 - 2 - 4	90
201-016-50	Remedial Activities for Secondary IV Mathematics: Technical and Scientific Option	2 - 3 - 3	75
201-103-DW	Calculus I	3 - 2 - 3	75
201-105-DW	Linear Algebra	3 - 2 - 3	75
201-203-DW	Calculus II	3 - 2 - 3	75
201-257-DW	Mathematics - Statistics for Computer Science	3 - 2 - 3	75
201-401-DW	Statistics for Social Science	2 - 1 - 3	45
201-801-DW	Business Mathematics	2 - 1 - 3	45
201-811-DW	Intro to Applied Mathematics	4 - 2 - 4	90
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201-923-DW	Applied Mathematics	2 - 1 - 2	45
201-935-DW	Business Statistics	2 - 2 - 2	60
201-941-DW	Engineering Mathematics I	2 - 2 - 2	60
201-942-DW	Engineering Mathematics II	2 - 3 - 2	75
201-943-DW	Applied Math	3 - 2 - 3	75
201-BZF-05	Calculus III	3 - 2 - 3	75
201-BZS-05	Probability and Statistics	3 - 2 - 3	75
201-NYA-05	Calculus I	3 - 2 - 3	75
201-NYB-05	Calculus II	3 - 2 - 3	75
201-NYC-05	Linear Algebra	3 - 2 - 3	75

*PreU / Soc Sci*

*PreU / Sci&Eng*

*Optional*

*Compulsory*



## Course List

### Year 1 Term 1

- Calculus I
- General Chemistry
- Mechanics

#### English

#### Humanities

#### Physical Education

#### Complementary

### Year 1 Term 2

- Chemistry of Solutions
- Calculus II
- Waves, Optics & Modern Physics

#### English

#### French

#### Humanities

#### Physical Education

### Year 2 Term 3

- General Biology I
- Electricity & Magnetism
- Linear Algebra

#### English

#### Physical Education

#### Complementary

### Year 2 Term 4

- Science Option
- Science Option
- Science Option

#### English

#### French

#### Humanities

*Every student must take four English courses, two French courses, three Humanities courses, three Physical Education courses and two Complementary courses to receive a CEGEP Diploma.*

## Selection of Science Option Courses

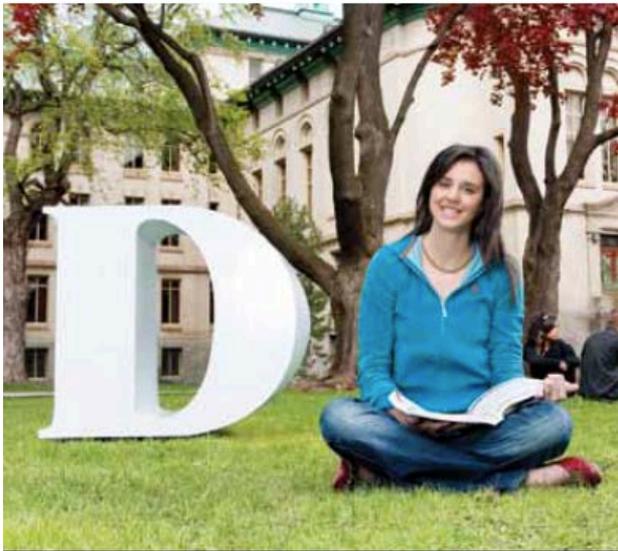
Pure and Applied Science students will choose 3 option courses from this list.

- General Biology II
- Probability and Statistics
- Human Anatomy and Physiology
- Calculus III
- Environmental Biology
- Astrophysics
- Organic Chemistry I
- Organic Chemistry II
- Engineering Physics
- Physical Geology
- Introduction to Computer Programming in Engineering and Science\*

300.A0

Dawson College

**Social Science**



**D** I S C O V E R

## GENERAL STUDIES 300.EA

General Studies is designed for students interested in exploring a wide variety of social science fields. In addition to Economics, History and Psychology, students must choose courses in three of the following disciplines: Anthropology, Biology, Business Administration, Geography, Mathematics, Philosophy, Political Science, Religion and Sociology.

### General Studies Course List - Year 1 Term 1

Required Courses (choose two)

- **General Psychology (100-Level)**
- **Western Civilization (100-Level)**
- **Introduction to Economics (100-Level)**

Option 100-Level Course (choose one from the following disciplines)

- **Anthropology**
- **Biology**
- **Business Administration**
- **Classics**
- **Geography**
- **Mathematics (Calculus I)**
- **Philosophy**
- **Political Science**
- **Religion**
- **Sociology**

**Physical Education**

**Humanities**

**English**

**Complementary**

### General Studies Course List - Year 1 Term 2

Required Course

- **Research Methods**

Required Courses (choose one)

- **General Psychology (100-Level)**
- **Western Civilization (100-Level)**
- **Introduction to Economics (100-Level)**

Option 100-Level Course (choose one from list on previous page)

Option 200-Level Course (choose one from 100-Level discipline previously taken)

**Physical Education**

**Humanities**

**English**

**Complementary**

### General Studies Course List - Year 2 Term 3

Required Course

- **Quantitative Methods**

Option 100-Level Course (choose one from list on previous page)

Option 200-Level Course (choose one from 100-Level discipline previously taken)

Option 300-Level Course (choose one from 100-Level discipline previously taken)

**French**

**English**

**Complementary**

### General Studies Course List - Year 2 Term 4

Required Course

- **Integrative Seminar**

Option 200-Level Course (choose one from 100-Level discipline previously taken)

Option 300-Level Course (choose one from 100-Level discipline previously taken)

Option 400-Level Course (choose one from a discipline in which you have previously taken a 200-Level or 300-Level Course)\*

**Physical Education**

**Humanities**

**English**

\* If you take two or three Mathematics courses, not including Statistics for Social Science, you do not take a 400-Level course.

## COMMERCE PROFILE 300.EB

The Commerce profile is designed for students interested in studying commerce, management, economics, or any business-related field at university. This profile is structured so that students take relevant courses in Mathematics and Business Administration while exploring the diversity of the social sciences through the program courses. These courses are central to the development of knowledge, skills and attitudes necessary for future studies and careers.

### Commerce Course List - Year 1 Term 1

#### Required Courses

- **Calculus I (100-Level)**
- **General Psychology (100-Level)**
- **Introduction to Economics (100-Level)**
- **Introduction to Business (100-Level)**

#### Physical Education

#### Humanities

#### English

### Commerce Course List - Year 1 Term 2

#### Required Courses

- **Western Civilization (100-Level)**
- **Basics of Marketing (200-Level)**
- **Calculus II or Calculus II Enriched (300-Level)**
- **Research Methods**

#### Physical Education

#### French

#### English

### Commerce Course List - Year 2 Term 3

#### Required Courses

- **Linear Algebra or Linear Algebra Enriched (200-Level)**
- **Quantitative Methods**

#### Option 100-Level Course (choose one)

- **Anthropology**
- **Biology**
- **Classics**
- **Geography**
- **Philosophy**
- **Political Science**
- **Religion**
- **Sociology**

#### Option 200-Level Course (choose one from 100-Level discipline previously taken)

#### Humanities

#### English

#### Complementary

### Commerce Course List - Year 2 Term 4

#### Required Course

- **Integrative Seminar**

#### Option 300-Level Course

#### Physical Education

#### Humanities

#### French

#### English

#### Complementary



## Course List

### Year 1 Term 1

- Logic of Programming
- Computer Fundamentals
- Computer Hardware and Software

#### Physical Education

#### Humanities

#### English

#### Complementary

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### Year 1 Term 2

- Software Development I: Java I
- Operating Systems I: Linux
- Internet Application Development I: HTML & CSS
- Math I: Linear Algebra

#### Physical Education

#### French

#### English

### Year 2 Term 3

- Software Development II: .Net with C# I
- Software Development III: Java II
- Database I: Oracle I
- Math II: Statistics

#### Humanities

#### English

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### Year 2 Term 4

- Software Development IV: .Net with C# II
- Internet Application Development II: JavaScript & CSS
- Database II: Oracle II
- Administration

#### Physical Education

#### French

#### Humanities

### Year 3 Term 5

- Software Development Project: Java III
- Mobile Software Development: Android
- Internet Application Development III: PHP
- Data Communications and Networking

#### English

#### Complementary

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### Year 3 Term 6

- Internet Application Project: Java Server Side
- Operating Systems II: Windows Server Internship in Industry
- Psychology: Human Relations



## Course List

### Year 1 Term 1

- Introduction to Economics
- Business Communications
- Introduction to Business
- Introduction to Computers

### Physical Education

### Humanities

### English

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### Year 1 Term 2

- International Business
- Introduction to Marketing
- Business Law
- Principles of Financial Accounting

### Physical Education

### Humanities

### French

### English

### Year 2 Term 3

- **Business Statistics**
- Career Management
- e-Commerce
- Accounting I
- Finance I
- Business Computer Applications

### English

### Complementary

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### Year 2 Term 4

- Computerized Accounting I
- Entrepreneurship
- Taxation
- Accounting II
- Finance II

### Physical Education

### French

### English

### Year 3 Term 5

- Accounting III
- Human Resource Management & Supervision
- Management & Cost Accounting
- Financial Planning
- Computerized Accounting II
- Business Analysis

### Humanities

### Complementary

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### Year 3 Term 6

- Negotiations
- Management
- Operations & Inventory Management
- Investments
- Computerized Project
- Stage

## V- A mathematical perspective (*cont'd*)

University education after the CEGEP...

- “DEC-BAC” pathway for some Technical programs
- Students specializing in STEM:
  - math majors  
*Analysis, etc.*
  - physics majors  
*usually math courses taught by the Physics Dept*
  - engineering students  
*3-4 math courses for engineers  
(advanced calculus)*

## VI- A personal perspective

I personally studied in the “classical system” — but I was an immediate witness of the transition to the CEGEP system (*my last years of classical studies were influenced by the then coming CEGEP framework*)

- I was at first skeptical about the merits of the CEGEP
- I have since totally changed my mind
  - because of my contacts with CEGEP colleagues
  - also because of the personal CEGEP experience of my three children

*I am today a firm supporter of the CEGEP system*

***THANK YOU!***

