

Title

Science in New Brunswick Schools, 1981-1990

Hypothesis

During the period of 1981-1990, there is a relationship between technological advancement and science education.

Discussion of Sources

Primary Sources

New Brunswick Department of Education, (1988) Chemistry 112/122

- Chemistry curriculum including program goals, learning outcomes, evaluation, and safety concerns etc.

Department of Education Statistics (1981-1990)

- Number of public schools and class sizes in New Brunswick from 1981-1990.

New Brunswick Department of Education, *Catalogue of Instructional Materials* (1985, 1987, 1988, 1989)

- A list of New Brunswick school textbooks for Science in these years.

New Brunswick Department of Education, (1990-1991). *Education Statistical Information*, Planning, Research and Communication Branch.

- Statistics for school enrolment by year, full-time equivalent teachers by year, pupil/teacher ratio by year.

Secondary Sources

Bramble, W. J., Mason, E. J., & Berg, P. (1985). *Computers in Schools*. New York: Mcgrall-Hill Inc.

- Introductory book about how to successfully integrate computers in the classroom.

Canadian Encyclopedia. Retrieved November 7, 2010, from

<http://www.thecanadianencyclopedia.com/index.cfm?PgNm=TCETimelineSearch&Params=A1>

- Timeline

Dufourd, P. (1984). *Biologie Humaine*. Ottawa: Éditions du Renouveau Pédagogique Inc.

- Biology textbook used in the French education program at École Sainte-Anne in the eighties.

MacBean, J., Beasligh, W., Cammelli, I., Clipsham, D. , McCormick, P. , & Vanderkuur, G. (1979). *Scienceways*. Toronto: Copp Clark Pitman.

- A science textbook used in New Brunswick's Junior High Schools in the eighties.

Oxenhorn, J. (1974). *Pathways in Biology*. New York: Globe Book Company, Inc..

- A Biology textbook used in New Brunswick's High Schools in the eighties.

Riedesel, C. A., & Clements, D. H. (1985). *Coping with Computers in the Elementary and Middle Schools*. Englewood Cliffs, NJ: Prentice-Hall Inc.

- A book that helps educators and students learn computer literacy, general classroom use, basic programming and what computers can bring for the future.

Smoot, R. C., Price, J., & Smith, R. G. (1987). *Chemistry: A Modern Course*. Toronto: Merrill Publishing Company.

- A high school textbook use in the New Brunswick education program in Chemistry during the eighties.

Stecher, A., Couchman, J., MacBean, J. C., & Wentworth, D. F. (1973, 1976). *Your Senses*. Toronto: Holt, Rinehart and Winston of Canada, Limited.

- One of a number of textbooks available for use in grades 4, 5 and 6 in New Brunswick's elementary schools.

Stecher, A., MacBean, J. C., Wentworth, D. F., & Couchman, J. (1971). *Birds*. Toronto: Holt, Rinehart and Winston of Canada, Limited.

- One of a number of textbooks available for use in grades 4, 5 and 6 in New Brunswick's elementary schools.

Stecher, A., Wentworth, D. F., Couchman, J., & MacBean, J. C. (1974, 1976). *The Dandelion*. Minneapolis: Holt, Rinehart and Winston of Canada, Limited.

- One of a number of textbooks available for use in grades 4, 5 and 6 in New Brunswick's elementary schools.

Taffel, A. (1981). *Physics its Methods and Meanings: Teacher's Guide* (4th ed.). Boston: Allyn and Bacon Inc.

- This teacher resource is used to assist in instructing the basic concepts surrounding Physics taught in New Brunswick high schools in the eighties.

Wentworth, D. F., Couchman, J., MacBean, J. C., & Stecher, A. (1975). *Ecology in Your Community*. Minneapolis: Holt, Rinehart and Winston of Canada, Limited.

- One of a number of textbooks available for use in grades 4, 5 and 6 in New Brunswick's elementary schools.

Wentworth, D. F., Couchman, J., MacBean, J. C., & Stecher, A. (1972). *Mapping Small Places*. Minneapolis: Holt, Rinehart and Winston Canada, Limited.

- One of a number of textbooks available for use in grades 4, 5 and 6 in New Brunswick's elementary schools.

Image & Media sources

Aerospace Guide, Retrieved November 7, 2010, from

http://www.aerospaceguide.net/spaceshuttle/challenger_disaster.html

- Space shuttle Challenger crew

Canadian Encyclopedia. Retrieved November 7, 2010, from

<http://www.thecanadianencyclopedia.com/index.cfm?PgNm=TCETimelineSearch&Prams=A1>

- Timeline of events from 1981-1990.

École Sainte-Anne, New Brunswick (1981-1990)

- Picture of Science project, picture of biology and chemistry labs.

I news catcher. Retrieved November 7, 2010, from

<http://www.inewscatcher.com/2010/04/exxon-valdez.html>

- Picture of Exxon Valdez tanker

Planet Burrito, Retrieved November 7, 2010, from

http://www.planetburrito.com/space_shuttle/

- Space shuttle Columbia

Webtek. Retrieved November 7, 2010, from <http://www.webtek.no/titanic/>

- Picture of Titanic Wreck.

Teaching and Learning Resources in Science Education

Through the “Catalogue of Instructional Materials” which was found at the Department of Education, Place 2000, Fredericton, we found the following textbooks were used in New Brunswick between the years 1981 and 1990:

Elementary Science Education

We found that in the “Catalogue of Instructional Materials”, the grades 4, 5, and 6 textbooks were broken down into 2 groups. Teachers were able to choose from either category. In group A we were able to find many of the listed resources. This group consisted of the following texts:

“Birds”

“The Dandelion”

“Ecology in Your Community”

“Mapping Small Places”

“Pollution”

“Running Water”

“Small Creatures”

“Snow and Ice”

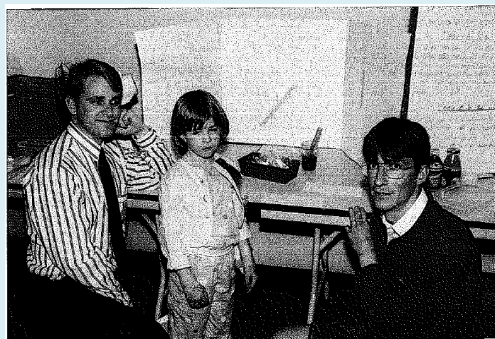
“Your Senses”

These were a series of small textbooks and teacher resource guides. The entire series was entitled “Examining Your Environment”.

We found it interesting that “Mapping Small Places”, was included in the Science Unit. The text talks about orienteering and this subject is now often included in an outdoor physical education unit.

“Ecology in your Community” talks about saving the environment and uses inquiry-based learning much the same as is being stressed now.

One thing that surprised us was an entire textbook on dandelions. However, having looked at the text we discovered it covered weather (optimal growing conditions), some math, adaptations, classifying, different environments, and even different uses for dandelions (food, dye).



Source: *École Sainte-Anne*, New Brunswick (1990), Science Project

The series seemed to be a great resource for environmental studies, covering a great deal of material but making children aware of all the things in their environment.

Although the books were used in New Brunswick elementary schools during the eighties, they were published in 1972 therefore, making them an old resource at that time. Nonetheless, many of the ideas were up to date.

We were unable to find the textbook called “Elementary Science”, this was intended to teach Grades 1-8.

One of the Group B textbooks for Grades 4-6 was called “Space, Time, Energy & Matter”. Unfortunately, we were unable to locate this textbook. There were also Teacher’s Guides to Science with a number of different Environmentally-based guides.

Science				Running Water			
				080190.BK	Book	\$	10.04
				HRW	1:2 A 4-6		
Science-Elementary				Running Water			
				080210.TG	Techr Guide	\$	3.20
				HRW	1:1 B 4-6		
Teacher's Sourcebook				Small Creatures			
Elementary Science				080200.BK	Book	\$	10.04
080030.TE				HRW	1:2 A 4-6		
HBJ 1:1 B 4-8				\$	34.00		
Science Grades 4-5-6				Small Creatures			
				080220.TG	Techr Guide	\$	3.20
				HRW	1:1 B 4-6		
Science: Grades 4-5-6 Group A				Snow And Ice			
Choose material from either Group A OR Group B				080240.TG	Techr Guide	\$	3.20
				HRW	1:1 B 4-6		
Birds				Snow & Ice			
080150.BK				080120.BK	Book	\$	10.04
HRW 1:2 A 4-6				HRW 1:2 A 4-6			
				\$	10.04		
Birds				Your Senses			
080270.TG				080110.BK	Book	\$	10.04
HRW 1:1 B 4-6				HRW 1:2 A 4-6			
				\$	10.04		
The Dandelion				Your Senses			
080100.BK				080230.TG	Techr Guide	\$	3.20
HRW 1:2 A 4-6				HRW 1:1 B 4-6			
				\$	3.20		
The Dandelion				Science: Grades 4-5-6 Group B			
080280.TG				Choose material from either Group A OR Group B			
HRW 1:1 B 4-6							
				Space, Time, Energy & Matter, Book 4			
Ecology In Your Community				080050.BK	Book	\$	13.58
080130.BK				1978 AW 1:1 A 4 Rockcastle & Others			
HRW 1:2 A 4-6				\$	13.58		
				Space, Time, Energy & Matter, Book 5			
Ecology In Your Community				080060.BK	Book	\$	15.27
080250.TG				1978 AW 1:1 A 5 Rockcastle & Others			
HRW 1:1 B 4-6				\$	15.27		
				Space, Time, Energy & Matter, Book 6			
Mapping Small Places				080070.BK	Book	\$	15.27
080220.BK				1978 AW 1:1 A 6 Rockcastle & Others			
HRW 1:2 A 4-6				\$	15.27		
				Space, Time, Energy & Matter, Book 4			
Mapping Small Places				080080.TE	Teacher Ed	\$	25.71
080340.TG				1978 AW 1:1 B 4 Rockcastle & Others			
HRW 1:1 B 4-6				\$	25.71		
				Space, Time, Energy & Matter, Book 5			
Pollution				080090.TE	Teacher Ed	\$	26.74
080170.BK				1978 AW 1:1 B 5 Rockcastle & Others			
HRW 1:2 A 4-6				\$	26.74		
				Space, Time, Energy & Matter, Book 6			
Pollution				080100.TE	Teacher Ed	\$	27.75
080200.TG				1978 AW 1:1 B 6 Rockcastle & Others			
HRW 1:1 B 4-6				\$	27.75		

(New Brunswick Department of Education, *Catalogue of Instructional Materials*, 1987)

Our assumption is that schools were choosing group A textbooks over group B textbooks. This is based on the fact that we were unsuccessful in finding any of the Group B textbooks. We assume that the more popular textbooks in the eighties were more accessible in the present day.

Junior High Science

The textbook that we researched for Junior High (Grades 7-9) was called “Scienceways”. This text covered a wide range of subjects including magnets, earth’s poles, speed, and geology. There seemed to be less covered about ecology in the community than in the elementary grades. It also gets into a little bit of biology and some classification.

High School Science

“Chemistry: A Modern Course”

This textbook is used as an introduction to chemistry which focuses on being relevant as well as comprehensive. “The central theme of the textbook is the basic principle that the properties of matter are a consequence of the structure of matter. Balanced approach is present in combining chemical theories and concepts with quantitative problems”. (Smoot, Price & Smith, 1987). The basic idea behind this textbook is to encourage students to think for themselves as they are challenged to develop a better understanding of their physical world.

As this textbook was re-published in 1983 and 1987 it is safe to say that all the material was up to date and accurate which allowed for it to be a great teaching tool.

“Physics: It’s Methods and Meanings”

This textbook, which was published in 1981, was used as an introductory teaching tool for high school sciences. As it was published in the 80s, it would have been a very appropriate aide for the students to learn from and would have been current in terms of its information. The basic topics covered in the text are:

- 1) To acquire an understanding of the present-day concepts of matter and energy.
- 2) To learn how these concepts developed from earlier ideas and thus to become aware of the methods by which scientific understandings evolve.
- 3) To master some of the quantitative relationships that express these understandings and to acquire skill in using them.

“Biologie Humaine”

We found a French High School textbook called “**Biologie Humaine**” which covered three main subjects; nutrition, human physiology and reproduction. It was published in 1984 and was therefore teaching current science and theories. The textbook focuses on teaching the students to think for themselves while learning about their bodies. This text was sourced directly from the school, École Sainte-Anne in Fredericton.

Although we did not access the following books, the Catalogue of Instructional Materials 1987-1988 tells us that these were available:

“Biological Sciences: An Introductory Study”

“Understanding Living Things”

“Cancer Education”

“Biological Science: A Molecular Approach”

The textbook that we researched was called “**Pathways in Biology**”. This book was used for a 10-3 biology course and covered cells, living and non-living things, evolution (“The Origin of Species”) and classification. There is also some material covering the basics of genetics.

There was a great deal of textbook resources available at the Junior High and High School level which indicates that the subject was well developed in the school system.

Microcomputers

Microcomputers were becoming popular during the late 1970s and early 1980s. During this early time they had relatively little memory and capability but the public was just beginning to understand how to use them. During the mid 1980s they were beginning to be used more as tools for education in the school system. The software applications were becoming more advanced, useful and user-friendly for educators and students (Bramble, Mason & Berg, 1985).

Scientists began to use microcomputers in their everyday work which helped them analyse and organize the data that they have accumulated (Riedesel & Clements, 1985). With this in mind, it is assumed that science education programs in schools would have been using the microcomputers as well for the same purpose.

The microcomputer`s speed, reliability, accuracy and memory were beneficial tools for the classroom as well as in the professional world (Riedesel & Clements, 1985).

Context of Education in New Brunswick

The number of public schools in New Brunswick varied over the course of the decade, from 453 schools in 1981 to 421 schools in 1989. The general trend was that there was a constant reduction in the amount of public schools in the province.



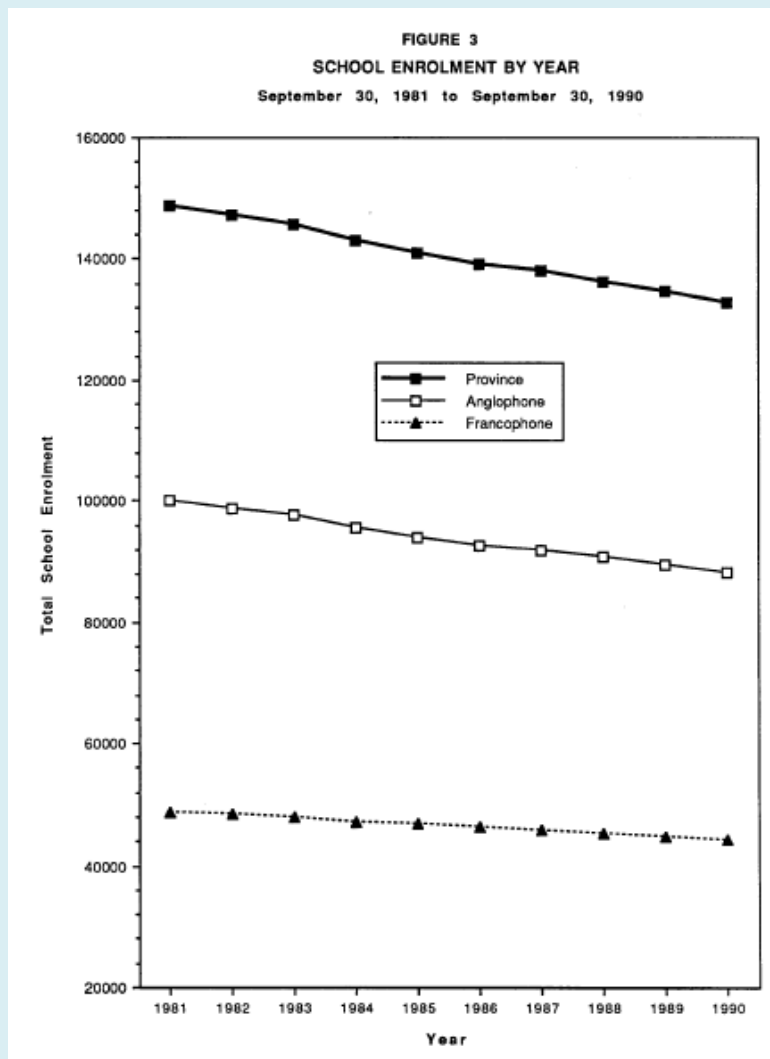
Source: *École Sainte-Anne*, New Brunswick, Biology Laboratory



Source: *École Sainte-Anne*, New Brunswick, Chemistry Laboratory

Looking at the New Brunswick Education Statistical Information, 1990-1991:

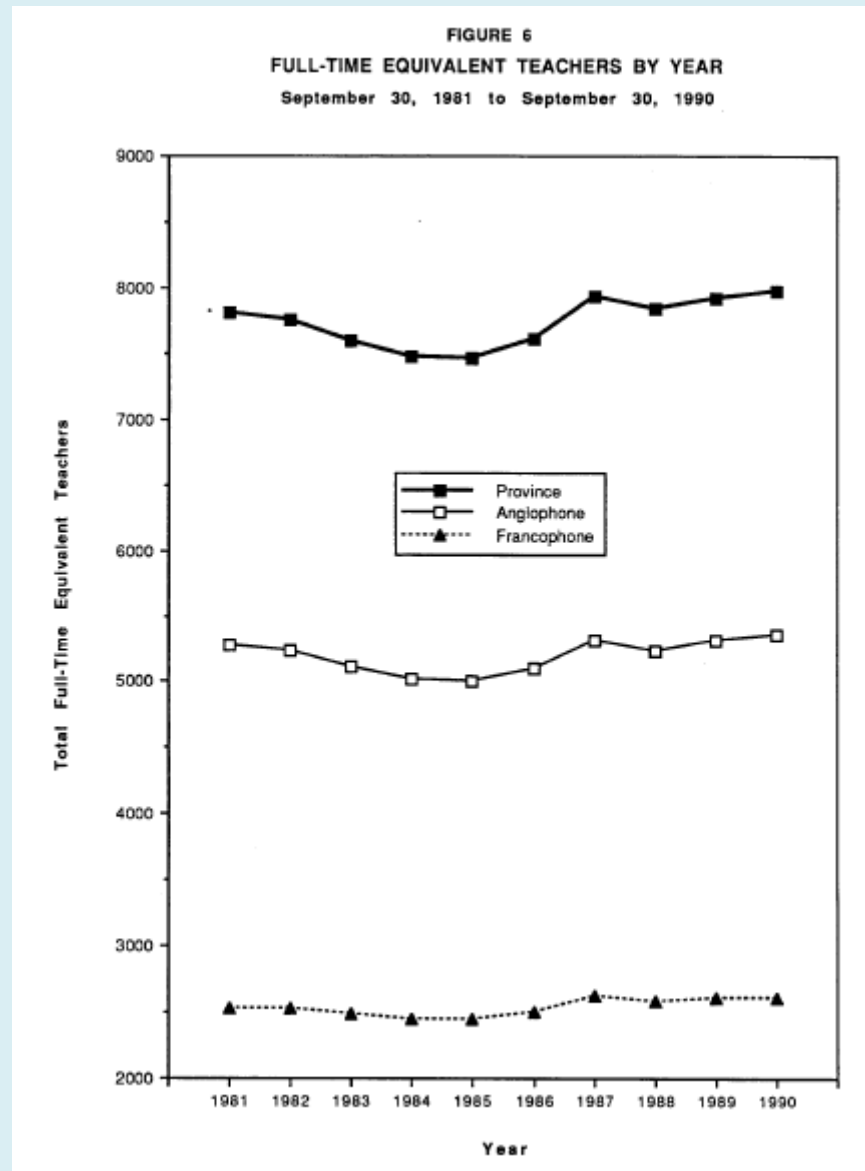
School enrolment by year



Source: *Education Statistical Information, 1990-1991*

The above graph portrays school enrolment by year, from September 30, 1981 to September 30, 1990. A gradual decrease of student enrolment in public schools can be observed by looking at both the Anglophone and Francophone districts, however, the Anglophones have a bigger decrease in numbers overall.

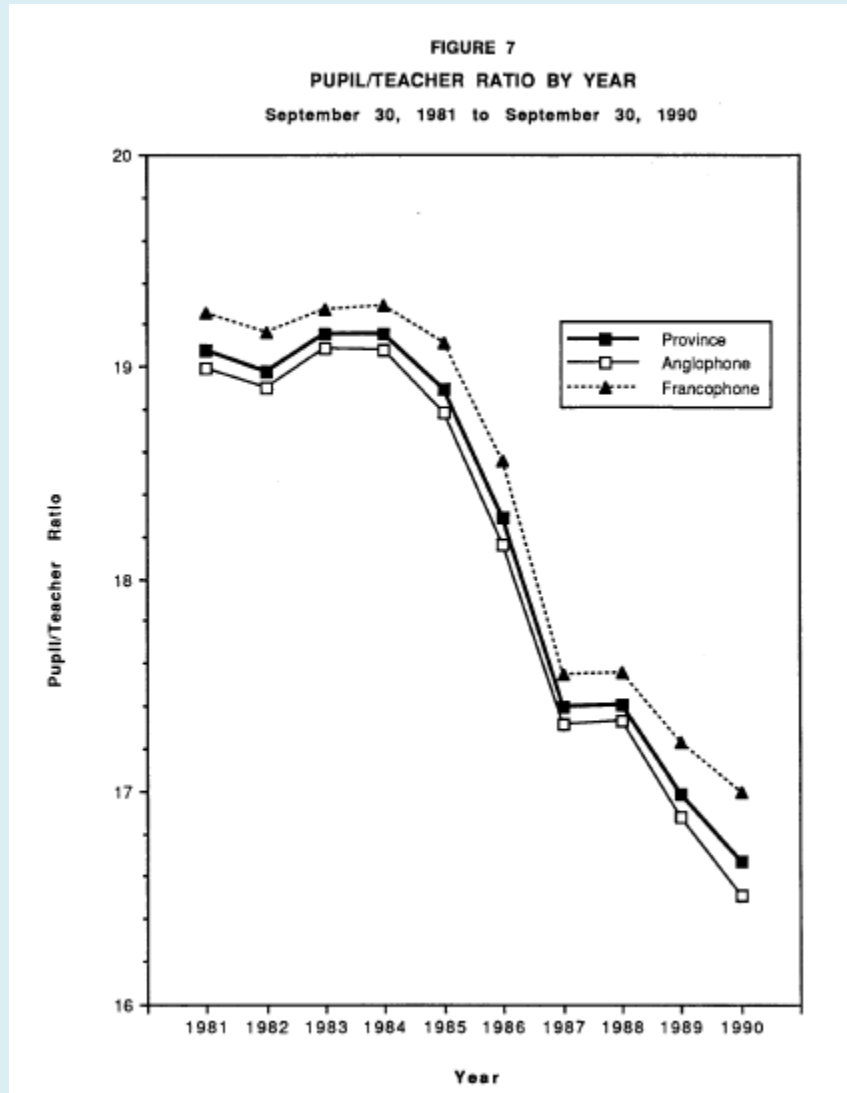
Full time teachers by year



Source: *Education Statistical Information, 1990-1991*

The graph above illustrates full time equivalent teachers by year, from September 30, 1981 to September 30, 1990. The graph shows that, through the years, there had been a variation, however, the number of teachers had increased overall by the year 1990. Both Anglophone and Francophone graphs seem to follow the same general pattern.

Pupil/Teacher ratio by year



Source: *Education Statistical Information, 1990-1991*

This last graph depicts the pupil to teacher ratio by year from September 30, 1981 to September 30, 1990. This graph essentially combines the last two graphs and reveals that as the number of students is dropping over the years, the teachers are increasing. This is demonstrated by the ratio dropping dramatically. In other words, as the years go by

teachers have to teach a smaller group of students. Anglophone and Francophone curves follow each other almost exactly.

We speculated on why this was occurring. Here are a few possible explanations on the trend. To begin with, it was thought that families were moving out of the province as the economy made things more difficult to live in more rural areas. However, it was discovered that the population was actually increasing in New Brunswick and that this could not be a factor in decreasing numbers of students in schools. Perhaps, this is explained by longer life expectancies therefore increasing the general population but not the number of students. People at this time are beginning to have smaller families and so the student population begins to get smaller. We speculate that the increase of teachers in relation to students changed because of the realisation that a smaller teacher to student ratio has a positive effect on student learning.

Broader Social and Scientific Context

In 1981 the population of New Brunswick was 696,403. By 1986, it had increased to 709,442 and five years later it was larger again at 723,900.

Below is a timeline sourced from the Canadian Encyclopedia, illustrating things that happened during the decade in Canada:

- “Acid Rain Consciousness Raised 1982 - Canada charged that air pollution originating in the US had killed all the fish in 147 Ontario lakes, raising the world consciousness of acid rain.”
- “Canada Act Passed *Mar 8, 1982* - The British House of Commons passed the Canada Act of 1982. It was adopted by the House of Lords on March 25. The Act ended British legislative jurisdiction over Canada. Queen Elizabeth II signed the proclamation in Ottawa on April 17.”



- “Charter comes into effect *Apr 17, 1982* - The Canadian Charter of Rights and Freedoms came into effect. The Charter guarantees all Canadians fundamental rights, democratic rights, mobility rights, legal rights, equality rights and linguistic rights.”



- “Canadian Astronaut Program 1983 - The National Research Council invited applications for the Canadian Astronaut Program.”
- “Titanic Wreck Found Sep 1, 1985 - A US-led expedition discovered the wreck of the Titanic, 590 km southeast of Newfoundland at a depth of 3810 m.”



Source: <http://www.webtek.no/titanic/>

- “Launch of *The Canadian Encyclopedia* Sep 6, 1985 - Edmonton publisher Mel Hurtig launched *The Canadian Encyclopedia* at a gala at Edmonton's Citadel Theatre.”



- “Air India Disaster Jun 23, 1985 - The worst air disaster associated with Canada and the third worst in history was the explosion, likely from a terrorist bomb, of Air India Flight 182 from Toronto. The plane crashed into the North Atlantic off the coast of Ireland, killing all 329 on board.”

- “George Wong Sets Speed of Sound 1986 - Canadian scientist George Wong published his findings correcting previous figures for the speed of sound. Wong's figure was 331.29 m per second.”
- “Parrsboro, NS, Dinosaur Find 1986 - A major dinosaur find near Parrsboro, NS, revealed 100 000 fossilized jaws, skulls and teeth. It was the largest find in the world from the Triassic and Jurassic periods.”
- “World Oil Prices Drop 50% 1986 - World oil prices dropped 50%, forcing the cancellation of energy investments across the country and battering the economy of the western provinces.”
- “Montréal Protocols on Ozone 1987 - Fifty-three industrial nations signed the Montréal Protocols, an agreement to eliminate chlorofluorocarbons, the cause of ozone depletion.”
- “Exxon Valdez Hits Reef 1989 - The tanker Exxon Valdez hit a reef and leaked millions of gallons of crude oil, contaminating 1500 km of Pacific coastline. Some 6000 otters and a half million birds died.”



Source: <http://www.inewscatcher.com/2010/04/exxon-valdez.html>

Many of the issues that were highlighted in this section are still relevant today. The Exxon Valdez oil spill was probably the largest environmental disaster in North America for a long time; until this past summer when the United States experienced its own oil disaster off the coast of Louisiana. The world has yet to see the full effects of this devastating event. Science has yet to find a means of breaking down the oil without harming the habitat of the ocean. This proves the importance of science education to help advance research.

Below is a timeline sourced from the Canadian Encyclopedia, illustrating things that happened during the decade in the world:

- “Space Shuttle Columbia Lifts Off 1981 - The space shuttle Columbia lifted off from Cape Canaveral, the first American manned flight in space in 6 years.”



Source: http://www.planetburrito.com/space_shuttle/

- “Canadarm Activated in Space Nov 14, 1981 - Astronauts aboard the space shuttle Columbia first activated the Canadarm in space. The Canadarm was first used in a repair mission in 1984.”
- “Severe Recession Hits Canada 1982 - The recession was particularly severe as GDP dropped by 6.7% over a period of 18 months.”
- “Alert Air Pollution Lab 1986 - Canada's first air pollution research laboratory was inaugurated at Alert to permit scientists to track changes in the composition of the Arctic atmosphere over the following decades.”
- “The Space Shuttle *Challenger* disaster occurred on *January 28, 1986*, when it broke apart seconds into its flight, leading to the deaths of its seven crew members. The spacecraft disintegrated over the Atlantic Ocean, off the coast of central Florida, United States. ”



Source: http://www.aerospaceguide.net/spaceshuttle/challenger_disaster.html

Many eyes were on the Space shuttle Challenger when it launched in January 1986.

Christa McAuliffe was part of the Teacher in Space Project (NASA program) and she

was the first teacher going into space. This meant that the world was following her journey and made this disaster that much more personal to many.

- “First Nuclear Arms Reductions *Dec 8, 1987* - US president Reagan and Soviet president Gorbachev signed the Intermediate Nuclear Forces treaty in Washington, DC, the first nuclear arms reduction agreement.”
- “Free Trade Goes Into Effect *Jan 1, 1989* - The Free Trade Agreement between Canada and the US went into effect. The pact, later expanded through NAFTA, would profoundly alter the economic relationship between Canada and the United States.”



Source: http://www.cbc.ca/news/background/canada_us/

Relation or Significance of Study for Education in

New Brunswick Today

The continuous use of new technology, including computers will assist learners and educators in further knowledge in science education. More importance was given to science. There seems to be an emphasis on Math and Literacy in schools today that seems to push out science education along with other subjects. During the period, 1981-1990 there seemed to be more emphasis on science education than today, especially at the elementary levels. Technology in the school system seems to be taking the lead over other subjects pushing everything but math and literacy to the back burner.

We found it very difficult to determine how science in general changed or affected how science is taught in the school system at present. There appears to be minimal advancement in science education as we found no significant changes that affected the study of science.

Conclusions

There is a relationship between technological advancement and science education although it does not appear to be crucial based on the use of technology at the time. The 1980s is the beginning of technological advancement like computers in schools. We know that there is a great deal of value in the technology available, the use of the internet and advanced software programs, with the knowledge that we have today. It was found that science education was very important as was its technology; this is why they are so relevant in New Brunswick schools now.