

Building Canada's Competitive Strength

The Role of Canada's Polytechnics

Prepared for Polytechnics Canada

by

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Executive Summary

Overview

Canada must increase both the quantity and quality of its post-secondary graduates, (but particularly their quality), especially in the technical and business sectors, if it is to remain economically competitive in the global export marketplace.

Canada's prosperity is built directly upon the strength of its export success. Canada is one of the world's most trade-oriented nations, with up to 40 percent of its gross domestic product sold outside its borders.

Exports have been and will remain critical to maintaining Canada's global competitive position, and as technological change accelerates, the standard of performance expected of all the economy's players will increase.

As a country, Canada cannot compete in numbers. It must compete in quality.

Positioning Canada's Polytechnics

They are integral to enhancing the country's global competitive position

The eight members of Polytechnics Canada make a critically important contribution to the strength of Canada's economy and its competitive position in the world. They are:

- The British Columbia Institute of Technology in Vancouver
- Conestoga Institute of Technology and Advanced Learning in Kitchener-Waterloo
- George Brown College in Toronto
- Humber Institute of Technology and Advanced Learning in Toronto
- Northern Alberta Institute of Technology in Edmonton
- SAIT Polytechnic in Calgary
- Seneca College in Toronto
- Sheridan Institute of Technology and Advanced Learning in Oakville

These publicly-funded post-secondary institutions provide a unique and distinctive range of education and training services to more than 500,000 Canadians annually including Bachelor's Degrees, diplomas, certification programs, apprenticeships, customized training for business and government, on-line learning and continuing education. In addition, they conduct applied research in collaboration with industry and also offer joint degrees with universities.

They can meet global competitive pressures which are increasing the demands on post-secondary-education

Among OECD countries, Canada has the highest proportion of its working-age population who are post-secondary graduates, but foreign companies competing with Canadian enterprises have a labour pool with more depth and breadth. China and other developing societies have identified education as a priority development strategy. Barring exceptional circumstances, Canada's educational advantage will erode rapidly over the next decade, at least with respect to the *proportion of those educated*.

Canada's response to rising competitive pressures should focus on established strengths in the polytechnics and take them to an advanced level

Canada, with a small population, cannot increase its educational edge merely with the weight of numbers, so it must emphasize the excellence of its graduates and the precision and quality of their education.

Polytechnics are best positioned to respond with the level of advanced skills that the global economy demands.

Canada's polytechnics are playing a unique and indispensable role in guarding and extending Canada's export competitiveness by ensuring that Canada's labour force remains one of the best educated on earth and that it is being educated in a way that most closely meets the requirements of the future. With their strategic focus on technical and business skills and their sensitivity to marketplace needs, the polytechnics are unique in their ability to respond quickly to the ever-shifting need for advanced forms of applied education.

Notwithstanding Canada's relative educational strength compared to the U.S., the difference in absolute numbers between Canada and the U.S. remains a cause for concern. This is especially so if Canada wishes to have a highly-diversified export base. Canada's strength in resources can take the economy only so far.

The technical and business orientations of the colleges are also apparent with respect to the total enrolment in the colleges and universities respectively. Enrolment in technology equals 32.8 percent of the colleges' total career-related enrolment, while the equivalent value for the universities is 20.4 percent. (or 23.7 percent of their undergraduate enrolment alone). In addition, business enrolment of the colleges equals 27.3 percent of their total enrolment, while it represents only 9.9 percent at the undergraduate level of the universities.

The Polytechnics of Canada

With more than 94,000 full-time students enrolled, collectively they represent at least 20 percent of the overall enrolment of the college system

In 2005/2006, the more than 36,000 graduates of the polytechnics alone represented about a 14 percent increase in the net number of persons employed over that time period.

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The 13,878 technical graduates of the polytechnics represent about 38.2 percent of their total graduates. Their 8,487 business graduates represent about 23.3 percent of the total. The polytechnics also make a critically important contribution to the skills development of existing workers. In 2005/2006 the polytechnics helped more than 179,000 workers upgrade their career-related skills in continuing education courses, a number greater than that of full-time students.

The polytechnics are presently involved in more than 150 research projects, covering more than 20 areas of focus within more than 20 specific research centres. These activities include research in manufacturing, materials, energy, media and design, health, construction and architecture, information technology, the environment and business.

Canada's Competitive Challenges

Having enjoyed the economic success that comes from having the largest proportion of post-secondary graduates among the OECD countries, Canada now faces new competitive challenges:

One: The number of post-secondary graduates is sharply rising throughout the world, both in absolute numbers and often in proportion to the population. Exporting companies in competitive nations have the advantage of a much larger pool of talent from which to draw workers. This improves the quality of their choices and the availability of highly-specialized skills. The size of the labour pools, especially in Asia, means that the wage rates of competing companies are relatively low.

Two: Canada is losing one of its greatest long-run export advantages. Its proximity to the U.S. was always a powerful export advantage. Ease of movement in an integrated transportation system, strong communication links, similar language, business and legal structures all combined to give Canada's exporters an important advantage, one that

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was *already* compensating for the limited size of the Canadian labour pool and its skill set. But Canada's geographical advantage is eroding as the global transportation system continues to strengthen its links and its infrastructure. Communications are now so improved that it is as easy for someone in Shanghai to talk to New York as it is for someone in Toronto. Global competitors are also growing in knowledge and sophistication in their understanding of the U.S. marketplace.

Three: The continued strength of the Canadian dollar means Canada's advantage from having skilled labour that was relatively cheap is disappearing, leaving Canada with a relatively small pool of expensive labour.

Four: Canada cannot rely for prosperity on resource exports alone, but progress towards greater export diversification has slowed and manufactured exports, burdened by the Canadian dollar, have weakened.

Polytechnic Responses to Challenges facing Canada

The only sustainable way to increase the diversification of our export base is to increase Canada's educational advantage. When uncontrollable circumstances cause other export advantages to fade, the education and skill set of Canadians remains firmly within Canada's power to improve. Canada's competitors, including India, China and Ireland have used education to create or increase their export advantage. China is massively increasing its educational facilities as part of its strategy to advance its economic strength and export power.

Canada has no choice but to play the same game. With its limited population base, it needs to play the game very well, applying its focus and resources as carefully and precisely as possible.

The polytechnics are already positioned to play a central role in this effort to take Canada's education strength to a higher level by:

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- Increasing the content and length of their programs and offering programs that lead to applied degrees
- Increasing and strengthening their applied-research activities in order to attract and develop the calibre of faculty necessary for more sophisticated programs of study.
- Concentrating their efforts on exactly those skills that underpin global competitive success; technical and business skills. Indeed, more than 60 percent of the graduates are in these two key areas. And almost all of their degree programs are in either technology or business
- Improving relationships with Canadian enterprises. This gives them an intimate and immediate understanding of the ever-shifting needs of the marketplace.

While the broad Canadian college sector can respond faster than the universities, the polytechnics are best positioned to respond with the level of advanced skills that the global economy demands.

Considered overall, the polytechnics play a unique and indispensable role in guarding and extending Canada's export competitiveness.

The polytechnics are ensuring that Canada's labour force remains one of the best educated on earth and that it is being educated in a way that most closely meets the requirements of the future. With their strategic focus on technical and business skills and their sensitivity to marketplace needs, the polytechnics are unique in their ability to respond quickly to the ever-shifting need for advanced forms of applied education. Such responses are essential for Canada to meet the competitive pressures arising on multiple fronts.

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The polytechnics are already serving this need. With greater public and government support, they can lead the way in creating the best-educated, most-skilled and most-flexible workforce in the world.

Building Canada's Competitive Strength: The Role of Canada's Polytechnics

Introduction

The eight members of Polytechnics Canada, comprised of the British Columbia Institute of Technology, Conestoga Institute of Technology and Advanced Learning, George Brown College, Humber Institute of Technology and Advanced Learning, Northern Alberta Institute of Technology, SAIT Polytechnic, Seneca College and Sheridan Institute of Technology and Advanced Learning, represent a critically-important set of institutions. In order to document and analyse the true extent of their contribution, it is necessary to set the polytechnics into their most appropriate overall context. This contextual analysis must address both the educational services being delivered and the needs that are being satisfied.

In addition, the scope of the analysis must be specified. While the value of learning for its own sake must be acknowledged, this study accepts that the predominant purpose of the polytechnics is to contribute to the prosperity of Canada. With that premise, the scope of the analysis becomes clear. Canada's prosperity is built directly upon the strength of its export success. Canada is one of the world's most trade-oriented nations, with up to 40 percent of its gross domestic product sold outside its borders. From the earliest days in fish, fur and timber, Canadians were international traders. And today, the range of Canada's exports has never been greater ranging from its traditional resources to sophisticated machinery, software and automobiles. Canada was born in the export trade, and in the export trade it will prosper.

Consequently, this study will set the polytechnics within the context of the global economy, specifically with respect to the major countries of the industrial world. This means that we will look at the polytechnics in relationship to their national and international educational competitors. Unfortunately, the data is limited in a number of

ways since the use of education as a tool of economic policy is a relatively recent recognition. Nevertheless, the data is clear enough to offer emphatic guidance about the role of the polytechnics and their contribution. We will focus first on educational attributes globally. Then, we will consider Canada and the U.S. in particular. Later the focus will be on Canada and the polytechnics specifically. Since exports serve as the underlying theme, this study will pay particular attention to those skills most relevant to global competitive strength.

The Export Dynamic

The requirements for export success continue to shift and do so ever more swiftly. This is exactly what one would expect as competitive pressures rise, both from the increasing number of competitors and from the accelerating pace of technology. Of course, it is a high challenge for educational institutions to shift their focus as quickly.

Exports are so important to Canada that we must examine the historical record. In the *past*, export success arose from either the presence of natural endowments (fertile soil, forests, mineral deposits and so on), and/or an array of factories – each sector employing a large number of relatively unskilled workers. But as the drum beat of competition and technological change accelerates, the standard of performance expected of all the economy's players increases. The role of unskilled labour diminishes and that of higher skills is substituted. Moreover, the speed with which skill expectations are rising is itself accelerating. Even Canada's important natural resource industries demand highly skilled workers and managers. No longer is it just enough to have a mineral or energy deposit. Now ever more sophisticated exploration, extraction and transportation technologies are required, or the commodity is priced out of the marketplace.

The Export Dynamic

Broadly speaking, technology and business represent the categories of skill in highest demand with respect to the export industries. Where data permits, the study will focus on these skills explicitly. Moreover, the rising standard of performance of course means that the skills must be at the post-secondary level of attainment.

And even such broad categories as technology and business are insufficient for the dynamic of the global economy. Skill in information technology becomes especially important both in its own right *and* as an indispensable element of other technical skills. Business skills must now include a strong focus on marketing, especially with respect to the complexities of the international marketplaces. In addition, given how quickly technology changes, CEOs tell us that they need workers who can easily adapt and learn quickly from first principles. They want workers who can integrate technological and business expertise.

If that is not an aggressive enough set of expectations, the CEOs are also asking for such personal attributes as initiative, self-direction, pride in workmanship and a well-developed ability to communicate. (Skills Dialogue, Conestoga College)

Finally, it is becoming increasingly apparent that one of the most critically important skills for the twenty-first century will be the ability to innovate. As technological change accelerates, the applicability of past solutions erodes ever faster. This means that new solutions must be generated across the whole array of business enterprise. To be innovative is, of course, one of the highest of all intellectual skills.

These are the demands that Canada must meet. This is a daunting set of requirements for Canada because it has such a small population. This is in contrast to other countries that have the luxury of drawing on a much larger pool of talent, able to nurture a wider range of specialties and benefit from the probability of having “natural talent.” Canada, compared to its competitors, is always at the disadvantage of being one of the smallest players.

Canada's small population is one of its defining characteristics, a strength and a weakness. This characteristic must be a key part of any credible economic analysis.

Yet Canada has met the skills demand of the past. Otherwise, it would not have one of the highest standards of living in the world. The challenge awaits us in the future.

Post-Secondary Education in the Industrial World

Statistical agencies that generate international educational statistics have classified education into three levels, primary, secondary and tertiary, with sub-categories within each level. The educational institutions of each country have their unique aspects and as a result of these differences, none of the categories fit each country exactly. Still, the statistics capture the distinctions adequately. The primary and secondary levels correspond to Canada's elementary and secondary (high) schools respectively. Tertiary refers to what Canada would consider its post-secondary sector. This study will concentrate on the post-secondary sector and will use that term. The Organization for Economic Cooperation and Development (OECD) has recently completed a major review of the educational status of its member institutions. Table 1 presents the post-secondary educational attainment of OECD countries as a proportion of their total working age population and of those 25-34 years of age.

Considering either the 25-64 year old population or the 25-34 year old population, Canada is the best-educated OECD member state. Only Russia, a "partner country", has higher post-secondary attainment. Moreover, in most cases these are clearly not minor differences. Canada has 45 percent of its working age population with post-secondary education, compared to the OECD average of only 25 percent or the European Union (EU) average of 23 percent. With respect to the United States, Canada is six percentage points higher. With respect to the 25-34 year old population, more than half of Canadians hold post-secondary attainment, with Korea and Japan slightly behind

Table 1
Post-Secondary Attainment in the OECD Countries
As Percent of Selected Population
2004

	Total as Percentage of Population Age Range		Type as Percentage of Population 25-34 years old	
	25-64 years old	25-34 years old	University ¹	College ²
Canada	45	53	27	26
Australia	31	36	27	9
Austria	18	20	11	9
Belgium	30	41	19	22
Czech Republic	12	13	na	na
Denmark	32	35	27	8
Finland	34	38	24	14
France	24	38	22	16
Germany	25	23	15	8
Greece	21	25	17	7
Hungary	17	19	na	na
Iceland	28	31	28	3
Ireland	28	40	26	15
Italy	11	15	na	na
Japan ³	37	52	26	25
Korea	30	49	31	18
Luxembourg	23	31	17	13
Mexico	16	19	16	3
Netherlands	29	34	32	2
New Zealand	25	28	23	5
Norway	32	39	37	2
Poland	16	23	na	na
Portugal	13	19	na	na
Slovak Republic	12	14	14	1
Spain	26	38	27	12
Sweden	35	42	26	16
Switzerland	28	30	20	10
Turkey	9	11	na	na
United Kingdom	26	31	23	8
United States	39	39	30	9
OECD average	25	31	24	11
EU19 average	23	28	21	11
Partner Countries				
Brazil	8	8	na	na
Chile	13	18	14	4
Israel	45	49	34	15
Russian Federation	55	56	22	35

na: not available

1: ISCED 5-A (Type A)

2: ISCED 5-B (Type B)

3: 2003

Source: OECD

and Russia is a couple of percentage points ahead. Clearly, this is an exceptional accomplishment in which Canadians should take pride.

This level of attainment should not be surprising. If Canada did not have this high level of educational attainment, it would not have achieved the export success to date and its high standard of living. It is also clear that Canada's exceptional educational performance is primarily the result of the expanding contribution of the community colleges. While Canada's universities have educated a higher proportion of the population than the average of the OECD, university degree holders in Canada represent a smaller proportion of the population 25-34 years old than in Norway, Korea and the United States. This is without doubt a solid accomplishment by the universities, but it is not particularly exceptional in scope.

By contrast, the community colleges have made a contribution to educational attainment that is beyond the norm for the OECD countries. As a proportion of the population 25-34 years old, 26 percent have college attainment, well above the OECD average of 11 percent or the United States figure of 9 percent. Only Japan and Russia appear to have a non-university system of comparable scale. The scale and scope of Canada's community colleges is a primary source of Canada's educational advantage.

However, the past does not guarantee the future and there are clearly causes for concern.

While it is the usual practice to make educational comparisons based on the rates of change or data proportionate to the population, this approach can leave out a critical element. From the point of view of educational advantage, absolute numbers can have significant implications. As the study argued above, Canada is a small country with a relatively constrained labour pool, both with respect to its depth and breadth.

Although the international competitiveness of an economy is a function of such factors as capital endowment (machinery and equipment), public infrastructure, access

to technology and natural resources, education is relevant to the effective use of all the other factors. As competition mounts, the need for an educated labour force grows. Unfortunately, Canada's exporters have a more limited pool of talent to draw upon than their competitors. As a result, their ability to compete can be limited.

The degree of that limitation becomes apparent when the absolute number of post-secondary graduates is compared among a selection of OECD countries. Even with significant limitations in the data, the differences are remarkably stark. Canada and South Korea have about eight million post-secondary graduates. Mexico has seven million post-secondary graduates, almost as many as Canada, even though its proportion of graduates is lower. Germany, also with a significantly lower proportion of post-secondary graduates, has about twelve million post-secondary graduates. Japan has about 26 million post-secondary graduates. The United States has about 60 million post-secondary graduates.

These details are presented in Table 2.

Table 2
Number of Post-Secondary Graduates
Selected OECD Countries
2004/2005
(millions)

Canada	8
Germany	12
Korea	8
Japan	26
Mexico	7
Russia	46
UK	8
US	60

Source: Essential Economics – based on data from the OECD and World Population Report. These figures are approximate

The trends in enrolment rates are also challenging to Canada. For example, in the 25-64 year old age range, Japan's proportion of post-secondary graduates lags Canada. However, in the 25-34 year old age group, Japan basically matches Canada in total and with respect to both university and college equivalents. Clearly, Japan has been catching up.

Canada certainly did expand its post-secondary sector dramatically over the past several decades. However, its enrolment growth has slowed to a crawl, even as many of its international competitors have accelerated their growth. From 1995 to 2004, Canada increased its post-secondary enrolment by only 4 percent, compared to the OECD average increase of 49 percent. Consider that Ireland increased its enrolment 47 percent, Hungary 148 percent, Korea 59 percent, Mexico 52 percent and Turkey 68 percent. In the words of the OECD, "Tertiary (post-secondary) enrolment rates have barely increased compared to 1995, suggesting that the demand for tertiary qualifications is static in Canada, and it would be relatively easy for other countries to catch up" (OECD Briefing Note for Canada 2006, p.5).

Details are presented in Table 3 (next page).

The threat to Canada's educational status is also apparent when other non-OECD countries are included in the analysis. Looking at enrolment in post-secondary education from 1998-2002, United Nations data offers a sobering view. Canada's enrolment did not increase at all during this period of time. By contrast, China's enrolment rose 138.6 percent, India's 20.1 percent, Korea's 22.3 percent, Mexico's 21.7 percent and Brazil's enrolment was up 62.4 percent. Countries similar to Canada in structure and maturity of development also scored impressive gains. Enrolment in Australia was up 16.5 percent, Ireland 20.1 percent, Sweden 23.7 percent, the U.K. 9.9 percent and U.S. post-secondary enrolment was up 12.1 percent.

Table 3
Trends in Post-Secondary Enrolment
Selected OECD Countries
1995-2004

	Percentage Change in Enrolment 1995-2004
Canada	4
Australia	28
Austria	0
Belgium	20
Czech Republic	89
Denmark	32
Finland	29
France	5
Germany	8
Greece	101
Hungary	148
Iceland	102
Ireland	47
Italy	16
Korea	59
Mexico	52
Norway	18
Poland	169
Portugal	31
Spain	20
Sweden	52
Turkey	68
United Kingdom	24
United States	na
OECD average	49

Source: OECD

Interestingly enough, Japan's enrolment in post-secondary enrolment rose only 1.1 percent, similar to Canada's. It may be that Japan's rapidly-aging population is producing this effect.

It is hard to exaggerate the importance of these wide differences. It is clear that China and other developing societies have identified education as a priority development strategy. Barring exceptional circumstances, Canada's educational advantage will erode rapidly over the next decade, at least with respect to the *proportion of those educated*.

Details are presented in Table 4 (next page).

Table 4
Trends in Post-Secondary Enrolment
Selected Countries
1998-2002

Country	Percentage Change in Enrolment 1998-2002
Canada ₁	0
Australia	16.5
Brazil	62.4
China	138.6
Germany	6.8
India ₂	20.1
Ireland	20.1
Japan	1.1
Korea	22.3
Mexico	21.7
Sweden	23.7
United Kingdom	9.9
United States	12.1

1: to 2001
 2: from 1999

Source: United Nations

It is also instructive to look at enrolment in absolute numbers. Again, the competitive pressure that Canada faces on the educational front is apparent. France, Germany and Mexico each have about twice the post-secondary enrolment of Canada. Korea has well more than twice Canada's enrolment level. Japan has more than three times the enrolment of Canada, notwithstanding its rapidly aging population. Russia has about seven times the enrolment of Canada, and United States has about 14 times the enrolment. Together China and India have a post-secondary enrolment that equals about 80 percent of Canada's total population.

Details are presented in Table 5 (next page).

It is also appropriate to look at the type and quality of education being offered throughout the countries of the industrial world. The OECD offers data on the expected years of post-secondary education. While quality of education cannot necessarily be

inferred from its duration, it remains a variable of note. In this category, Canadians can expect to be engaged in post-secondary education for 2.9 years. This is slightly under the OECD average and well under the values for Australia, Finland, Iceland, Korea, New Zealand, Norway, Sweden and the United States. This is partly the result of Canada's relatively large community college systems whose programs are often of shorter durations than those in the universities. In educational competition, the bar just keeps rising.

Details are presented in Table 6 (next page).

Table 5
Number of Students Enrolled in
Post-Secondary Education
Selected Countries
2002

Canada ¹	1,192,570
Australia	1,012,210
China	15,186,217
France	2,119,149
Germany	2,334,569
India	11,295,041
Italy	1,913,352
Japan	3,984,400
Korea	3,223,431
Mexico	2,236,791
Norway	212,395
Russia	8,151,438
Spain	1,840,607
Sweden	414,657
United Kingdom	2,287,833
United States	16,611,711

1: 2001

Source: United Nations

Table 6
Expected Years¹ of Post-Secondary Education
OECD Countries
2004

Canada ²	2.9
Australia	3.6
Austria	2.3
Belgium	3.0
Czech Republic	2.1
Denmark	3.2
Finland	4.5
France	2.8
Germany	2.3
Greece	3.9
Hungary	2.9
Iceland	3.5
Ireland	2.9
Italy	2.9
Japan	na
Korea	4.3
Luxembourg	na
Mexico	1.2
Netherlands	2.7
New Zealand	4.2
Norway	3.6
Poland	3.3
Portugal	2.6
Slovak Republic	1.9
Spain	3.0
Sweden	3.8
Switzerland	2.1
Turkey	1.5
United Kingdom	2.8
United States	4.1
OECD average	3.0
Partner Countries	
Brazil	1.3
Chile	na
Israel	2.9
Russian Federation	na

1: Full and Part-time

2: 2002

na: not available

Source: OECD

Having previously identified the importance of technical skills, it is helpful to look at the available data. While technical skills go beyond the traditional “natural sciences”

designation, natural sciences can still be used as a proxy for the level of technical training.

Considering the data for the latter part of the 1990s, the percentage of graduates in natural sciences in Canada was higher than in such countries as Australia, Italy, Japan and Norway. Moreover, it was much higher than the equivalent value for the United States. However, Canada lagged behind such countries as Germany, Korea and China.

The absolute number of students enrolled in the natural sciences, assuming the graduate rates were unchanged, again emphasizes the disadvantages of Canada's size. For example, although Italy has a smaller proportion of natural sciences graduates, its enrolment still exceeds Canada's by a significant margin. And notwithstanding the large difference between the natural science graduation rates for Canada and the United States, the United States still has an enrolment almost ten times larger than Canada.

Details are presented in Table 7.

Table 7
Enrolment in Natural Sciences
Selected Countries
2002

	Number¹	Percent of Total Graduated²
Canada	331,534	27.8 (1996)
Australia	228,759	22.6 (1997)
China	5,315,175	35.0 (1994)
Germany	810,095	34.7 (1996)
Italy	440,070	23.0 (1996)
Japan	924,380	23.2 (1996)
Korea	1,234,574	38.3 (1997)
Mexico	731,430	32.7 (1994)
Norway	24,213	11.4 (1997)
Spain	414,136	22.5 (1995)
Sweden	116,103	28.0 (1997)
United Kingdom	633,729	27.7 (1997)
United States	3,139,613	18.9 (1995)

Source 1: Estimated from UNESCO data, assuming the pattern of graduation from the 1990s did not change.

Source 2: UNESCO (latest year)

Post-Secondary Education in Canada and the U.S.

An analysis of Canada's educational position among the major industrial countries invites two overriding conclusions. First, Canada has achieved a strong educational advantage for its labour force and this has provided international competitive success thus far. Second, this educational edge is being rapidly eroded as other countries see the importance of an educated labour force.

The response, from Canada's point of view, could hardly be clearer. Most of Canada's export competitors have or will have many more educated workers than Canada. Therefore, employers in these competing countries will have a breadth and depth of talent to choose from that is, or will be, greater than Canada's. Since Canada cannot compete on quantity, it will have to compete on excellence.

However, excellence has to be specifically defined or it will not be achieved methodically. It could hardly mean a vague emphasis on "quality" education. Rather, it must mean high achievement in those areas precisely focused on strategically-important export skills. In this arena, Canada can find its next platform for opportunity and advantage.

A more detailed understanding of education in Canada and the U.S. needs to be presented.

Post-Secondary Education in Canada and the U.S.

A detailed comparison between Canada and the U.S. is particularly helpful in any understanding of Canada's competitive position since at least 80 percent of Canada's exports are destined for the U.S.

It should also be noted that because of the size and wealth of the U.S. market, Canadian companies competing in the U.S. are not just competing with U.S. companies. They are also competing against the exports of the major countries of the industrial world. When a Canadian company makes a sale in the U.S., that company has

succeeded not just against U.S. suppliers but also with those of Europe, Asia and Canada's NAFTA partner, Mexico. To compete in the U.S. is in effect to compete on a global scale. Any other view becomes dangerously narrow.

Fortunately, a comparison between Canada and the U.S. is facilitated by the availability of more detailed data. It is often more comparable than that among other countries. Proceeding from the broad context of the industrial world, the study can now concentrate its analysis more specifically. We have already seen that the proportion of the population with post-secondary educational attainment is significantly higher in Canada than in the U.S. In the 25-64 year old age range, 45 percent of the population in Canada has post-secondary education, significantly higher than the 39 percent in the U.S. However, the number of persons with university attainment is lower in Canada than in the U.S. by eight percentage points. By contrast, the proportion of the population with college designation is 13 percentage points higher in Canada than in the U.S. This clearly reflects a relatively stronger community college system in Canada than in the U.S., providing Canada with an overall educational advantage. This advantage came with some significant underperformance from the point of view of university graduates.

Details are presented in Table 8.

Table 8
Post-Secondary Attainment by Population
Canada and the U.S.
2004

Percentage of the Population with Post-Secondary Education			
25-64 years of age			
	University	College¹	Total
Canada	22	22	45 ²
U.S.	30	9	39
Percentage-point Differences ³	-8	+13	+6

1: Non-university in the U.S.

2: Rounding error

3: Canadian proportion less U.S. proportion

Source: OECD

Post-Secondary Education in Canada and the U.S.

Among those between 25-34 years of age, Canada has a much greater advantage in post-secondary educational attainment, with 53 percent of the Canadian population having post-secondary education compared to 39 percent in the U.S. This now provides Canada a 14 percentage-point overall advantage. In addition, the Canadian proportion of university graduates increased sharply, reducing the disadvantage with the U.S. to only 3 percentage-points. Canada's advantage among college graduates has now increased to 17 percentage points.

While Canada has significantly increased the number of university graduates, it increased the number of college graduates to an even greater extent. This results in an expansion in the pool of persons with post-secondary attainment.

Of course, whether this shift is adequate for the needs of the future is an issue for further consideration.

Details are presented in Table 9.

Table 9
Post-Secondary Attainment
by Population and Employment
Canada and the U.S.
2004

Percentage of the Population with Post-Secondary Education			
25-34 years of age			
	University	College	Total
Canada	27	26	53
U.S.	30	9	39
Percentage-point Differences ¹	-3	+17	14

1: Canada's proportion less U.S. proportion.

Source: OECD

Of course from the point of view of the economy, the educational attainment of the employed labour force is particularly relevant. The picture that emerges is different in several important ways than that based on population. For this comparison we will focus on the educational attainment of the working age population.

Looking at the employed labour force in Canada, we see that university degree holders represent about 39.4 percent of all those employed who have achieved post-secondary education. College graduates, by contrast, represent 60.5 percent of the total. Both college and university graduates are over represented in the employed labour force compared to their proportion in the population. These effects on the employment of both college and university graduates reflect the educational attainment levels, the needs of the marketplace and the demographic makeup of Canada. With the population growing in educational attainment over time, those with less formal qualifications are moving out of paid employment, sometimes by choosing retirement and sometimes not.

In the U.S., university degree holders represent 54.9 percent of all those employed who have achieved post-secondary education and non-university graduates represent 45.1 percent. It should be noted that the U.S. non-university figure includes those with “some” study and graduates. The Canadian figures include only college graduates. As a result, the comparisons between Canada and the U.S. in this regard must be made cautiously. The issue is also complicated by the fact that the U.S. educational system is dissimilar to Canada’s and differences in the definition of graduates and college education may also apply. Notwithstanding these imperfections, the college graduate in Canada appears more important to the economy than the equivalent graduate in the U.S.

An important backdrop to these observations about employment is the fact that employment in Canada from January 1995 to August 2006 rose 24.4 percent, compared to a 15.8 percent increase in the U.S. As has been true in much of the post-war period, Canada creates jobs at a faster rate than the U.S. Also, Canada’s export volumes have risen substantially over the past decade. The increase in the number of those employed with post-secondary education, together with both export and labour-market strengths, can hardly be considered co-incidental.

Details are presented in Table 10.

Table 10
Employed with Post-Secondary Education
Canada and the U.S.
Number and Percent of Total
August 2006

	University	College¹	Total
Canada ² (,000)	3,776.6	5,786.8	9,563.4
Percent of total	39.4	60.5	100
U.S. ³ (,000)	41,495.0	34,101.0 ⁴	75,596.0
Percent of total	54.9	45.1	100

- 1: Non-university in the U.S.
- 2: 15 years of age and older.
- 3: 25 years of age and older.
- 4: Includes graduates and non-graduates: Canada includes only graduates.

Source: Statistics Canada, U.S. Bureau of Labor Statistics

Of course, it is as important to know what skills the graduates have as it is to know the number of graduates, both absolute and relative. First, we focus on technical skills, as commonly understood, since they are of central importance to merchandise exports. These goods are either manufactured or extracted and processed. Each step calls for technical skills that deliver a price and quality combination that is globally competitive. Moreover, the category of technical skills also typically includes information technology, a sector that also supports exports of information technology devices and software services.

Technical skills include understanding algorithms and modeling data in Computer Systems Technology, performing laboratory investigations related to the diagnosis, treatment and prevention of disease in Medical Laboratory Science, automation, robotics, manufacturing processes, project planning and business management in Manufacturing Technology.

Canada and the U.S. present a significantly different breakdown between technical and non-technical skills. Limitations in the data mean that the comparison of technical skills for Canada will be based on enrolment and for the U.S. based on attainment earned. While these are somewhat different measures, it is quite reasonable to assume that the graduate figures in Canada would be approximately equal to the enrolment breakdown. (There is no particular reason to assume that the graduation rates in technical fields are necessarily less than those in non-technical fields and certainly not to the degree of the difference we will note below.)

While Canada's community colleges have 32.8 percent of their enrolment in technical fields, U.S. technical graduates in non-Bachelor Degree programs equal only 22.5 percent. And while Canada's universities had 23.7 percent of their enrolment in technical fields, U.S. technical university graduates represented only 19.4 percent of their total graduates. These are significant differences and it is hard to avoid the conclusion or exaggerate its importance.

Canada emphasizes technical education to a significantly greater degree than the U.S., both at the college and university level. Indeed, Canada's universities have a stronger technical orientation than the non-degree granting institutions in the U.S.

The implication for Canada is clear. It should build on its established strength of technical education and extend it to a higher level. Moreover, Canada should be mindful of the emphasis on technical education in other countries, excluding the U.S.

Details are presented in Table 11 (next page).

While technical skills are essential to compete successfully in goods exports, it is not a sufficient skill set. Business skills must also be considered as essential for success, given the rising degree of competition and the growing complexity of business.

Table 11
Post-Secondary Technical Fields of Study
Canada and the U.S.

Canada		
Technical Fields of Study by Enrolment		
1998/1999		
	Number	Percent of Total
Community Colleges ₁	98,053	32.8 ₃
Universities ₂	118,551	23.7
U.S.		
Technical Fields of Study by Attainment Earned		
2002		
	Number	Percent of Total
Award less than Bachelor ₄	203,426	22.5
Bachelor Degree ₅	250,367	19.4

1. Enrolment in engineering and applied sciences, natural sciences and primary industries.
2. Enrolment in agricultural and biological sciences, engineering and applied sciences, mathematics and physical sciences.
3. Percent of career-related enrolment.
4. Awards in agriculture, architecture, biological sciences, communications, information sciences, construction trades, engineering, mathematics, mechanics, physical sciences, precision production trades, transportation and materials moving.
5. Awards in agriculture, architecture, biological sciences, information sciences, engineering, mathematics, physical sciences, transportation and materials moving.

Source: Statistics Canada, The U.S. National Center for Education Statistics.

On the same basis of comparison as in Table 11, we can examine the emphasis on business skills between Canada and the U.S. Again, Canada's community colleges have a stronger emphasis on business skills than Canada's universities and than either of the two broad categories of educational institutions in the U.S. Canadian colleges have 27.3 percent of their enrolment in business programs, with the U.S. equivalent at only 17.5 percent, an almost 10 percentage point difference.

Since Canada's universities have a smaller emphasis on business education compared to their U.S. counterparts, the colleges' strong emphasis alleviates what could be a serious disadvantage.

From the point of view of Canada's competitiveness, the implication is again straightforward. Canada should build on its strength in business education and extend it further.

Details are presented in Table 12.

Table 12
Post-Secondary Business Fields of Study
Canada and the U.S.

Canada		
Business Fields of Study by Enrolment		
1998/1999		
	Total	Percent of Total
Community Colleges	81,629	27.3
Universities	57,723	11.5
U.S.		
Business Fields of Study by Attainment Earned		
2002		
	Total	Percent of Total
Award less than Bachelor	158,229	17.5
Bachelor Degree	278,217	21.5

Source: Statistics Canada, The U.S. National Center for Education Statistics.

Notwithstanding Canada's relative educational strength compared to the U.S., the difference in absolute numbers between Canada and the U.S. remains a cause for concern. This is especially so if Canada wishes to have a highly-diversified export base. Canada's strength in resources can take the economy only so far.

The absolute numbers present a markedly different picture from the relative comparisons. There are almost 12 times as many university degree holders in the U.S. than in Canada; there are *only* three times as many college graduates (or their equivalents) in the U.S. as there are in Canada. With respect to immediately-applied skills, Canada's position is much stronger than among those skills typically associated with universities.

Since the world's problems are becoming progressively more complicated, there is a greater need for "advanced" education and skill. For any economic problem or

opportunity that the U.S. faces, it can draw upon a talent pool of post-secondary graduates that is about 7.7 times larger than that of Canada's.

Details are presented in Table 13.

Table 13
Estimated Number of Post-Secondary Graduates
Canada and the U.S.
2004

	University Graduates ¹		College Graduates ²		Post-secondary Graduates		Population 25-64
	Number	Percent of Population 25-64	Number	Percent of Population 25-64	Number	Percent of Population 25-64	
Canada	3,903,616	22	3,903,616	22	7,807,232	45 ³	17,743,711
U.S.	45,986,661	30	13,799,998	9	59,782,659	39	153,288,871

- 1: ISCED 5-A (Type A)
- 2: ISCED 5-B (Type B)
- 3: Rounding error.

Source: Educational attainment by percent of population : OECD
Population: Statistics Canada, U.S. Census Bureau

Post-Secondary Education in Canada

While this study is concentrating on the role of the polytechnics in Canada, it can only do so within the context of post-secondary education. As we have seen, Canada's community colleges emphasize technical and business education more strongly than the Canadian universities or than the university and non-university educational sectors in the U.S.

This emphasis is readily apparent when we look in more detail at total Canadian enrolment figures. In 1999/1998, the community colleges had 98,053 students enrolled in technical education full time; the universities had 139,544 students enrolled full time in technical education (118,551 at the undergraduate level and 20,993 at the graduate level). This means that the colleges had 41.3 percent of the total number of technical

students in the post-secondary sector, although they represent only 34 percent of total post-secondary enrolment, excluding university transfer students.

The colleges had 81,629 full-time business students enrolled and the universities had only 57,723 undergraduates enrolled. (Unfortunately, graduate business enrolment is not available.) Again with only 30.4 percent of total enrolment, the colleges had more students engaged in business studies than the universities. Even if business graduate enrolment was half of the “other” graduate category, the total number of business graduates from the colleges would still likely exceed that of the universities.

The technical and business orientations of the colleges are also apparent with respect to the total enrolment in the colleges and universities respectively. Enrolment in technology equals 32.8 percent of the colleges’ total career-related enrolment, while the equivalent value for the universities is 20.4 percent. (or 23.7 percent of their undergraduate enrolment alone). In addition, business enrolment of the colleges equals 27.3 percent of their total enrolment, while it represents only 9.9 percent at the undergraduate level of the universities.

This more detailed analysis merely reiterates the exceptional contribution of the colleges to the pool of technical and business skills, without which export success is jeopardized.

Details are presented in Table 14 (next page).

The Polytechnics of Canada

The polytechnics of Canada are leaders in applied education, training and research. With more than 94,000 full-time students enrolled, collectively they represent at least 20 percent of the overall enrolment of the college system (exact enrolment comparisons are not permitted because of limitations in the data.) In 2005/2006, the more than 36,000 graduates of the polytechnics alone represented about a 14 percent

increase in the net number of persons employed over that time period. In five years, the graduates of the polytechnics will add approximately one percent to the total pool of employed Canadians.

Table 14
Post-Secondary Enrolment
College and University Full Time
Canada
1998/1999

	Number	Percent of Total Post-secondary Enrolment	Percent of Total College Career-Related or University
Community College	403,516	41.0	--
University Transfer	104,618	10.6	--
Career Related	298,898	30.4	100
Technical ¹	98,053	10.0	32.8
Business	81,629	8.3	27.3
Other	119,216	12.1	40.0
University	580,376	59.0	100
Undergraduate	500,591	50.9	86.2
Technical ²	118,551	12.0	20.4
Business	57,723	5.9	9.9
Other	324,317	33.0	55.8
Graduate	79,425	8.1	13.7
Technical ²	20,993	2.1	3.6
Business	na	na	na
Non-business	25,879	2.6	4.5
Other	32,553	3.3	56

1. Enrolment in engineering and applied sciences, natural sciences and primary industries.
2. Enrolment in agricultural and biological sciences, engineering and applied sciences, mathematics and physical sciences.

Source: Statistics Canada

The 13,878 technical graduates of the polytechnics represent about 38.2 percent of their total graduates. Their 8,487 business graduates represent about 23.3 percent of the total. The polytechnics also make a critically important contribution to the skills development of existing workers. With rapidly changing technology in a dynamic and

competitive marketplace, workers at all levels must continue to improve their skills. Lifelong learning can no longer be seen as a desirable approach; it is essential. In 2005/2006 the polytechnics helped more than 179,000 workers upgrade their career-related skills in continuing education courses, a number greater than that of full-time students. This means that in one year the polytechnics contribute to the skills enhancement of approximately one percent of the employed labour force of Canada. Such contributions must be considered vital to the success of the economy.

Details are presented in Table 15.

Table 15
Canada's Polytechnics
Summary Profile
2005/2006

Total Number of Graduates	36,353
Total Number of Technical Graduates	13,878
Percent of Total Graduates	38.2
Number of Business Graduates	8,487
Percent of Total Graduates	23.3
Number Full-time Students Enrolled	94,605
Number of Full-time Business Students	37,133
Percent of Full-time Business Students	39.2
Number of Full-time Technology Students	29,807
Percent of Full-time Technology Students	31.5
Number of Unique Continuing Education Graduates	179,791
Number of Participants in Contract Training	34,087

Note: Numbers are approximate because of small differences in definition and time frame.

Source: Member institutions of Polytechnics Canada

Furthermore, in response to the rising demands of technology, the polytechnics are conducting their own applied research. They are presently involved in more than 150 research projects, covering more than 20 areas of focus within more than 20 specific research centres. These activities include research in manufacturing, materials, energy,

media and design, health, construction and architecture, information technology, the environment and business.

In manufacturing, research is underway in automated production, prototyping, microelectronic devices, soldering technologies, process machinery, and microchip design.

In materials, research is underway in plastics manufacturing.

In energy, research is underway in photovoltaics, fuel cells and wind turbines.

In media and design, research is underway in multi-media techniques and technology, design issues in society and design resources.

In health, research is underway in assisted devices, nutrition, bioinformatics, ultra-sound, diagnostic devices, respiratory therapy, clinical training and autism.

In construction and architecture, research is underway in building integrity, ventilation systems, bio-walls, healthy building systems, automated buildings, sustainability and building management systems.

In information technology, research is underway in network security and systems evaluation.

In environmental technology, research is underway in mobile water desalination plants.

As a further response to the needs of business and technology, the polytechnics are now offering applied degrees. This is a logical development that needs to expand. Presently the polytechnics offer 59 programs leading to applied Bachelor Degrees. More than 15 of them have co-operative education components. In addition, the polytechnics offer 21 degrees in association with universities. They offer such degrees as Bachelor of Science, Bachelor of Business Administration, Bachelor of Applied Business, Bachelor of Technology, Bachelor of Applied Technology, Bachelor of Applied Arts and Bachelor of Applied Music. They also offer nursing degrees in collaboration with other institutions.

The Role of the Polytechnics

The international competitive environment has defined the role of the nation's polytechnics. Having enjoyed the economic success that comes from having the largest proportion of post-secondary graduates among the OECD countries, Canada now faces new competitive challenges.

These new threats take several forms. The number of post-secondary graduates is sharply rising throughout the world, both in absolute numbers and often in proportion to the population. Each day, therefore, the talent pool of Canada's competitors grows deeper. In the most practical terms, exporting companies in competitive nations have the advantage of a much larger pool of talent from which to draw workers. This presumably improves the quality of their choices and the availability of highly-specialized skills. Moreover, the size of the labour pools, especially in Asia, often means that the wage rates of competing companies are relatively low.

Another aspect of the threat is the fact that Canada is losing one of its greatest long-run export advantages. Its proximity to the U.S. was always a powerful export advantage. Ease of movement in an integrated transportation system, strong communication links, similar language, business and legal structures all combined to give Canada's exporters an important advantage, one that was *already* compensating for the limited size of the Canadian labour pool and its skill set.

However, the situation is rapidly changing and Canada's locational advantage is eroding. The global transportation system continues to strengthen its links and its infrastructure. Communications are now so improved that it is as easy for someone in Shanghai to talk to New York as it is for someone in Toronto. Global competitors are also growing in knowledge and sophistication in their understanding of the U.S.

marketplace. That is quite apart from the powerful lure of the richest economy on earth.

As more of the world's countries join Canada figuratively on the doorsteps of America,

Canada's locational advantage fades. And the extent to which this locational advantage has compensated Canada for its small talent pool, the more the competitive pressure rises.

Added to these difficulties is the rising value of the Canadian dollar. As a result, Canada's advantage from having skilled labour that was relatively cheap is disappearing leaving Canada with a relatively small pool of expensive labour. While the Canadian dollar's value will change over time, there is no assurance it will diminish. Consequently, Canada has no choice but to assume that the dollar will remain relatively high and must take action to override this obstacle.

It is true that Canada's handsome resource endowment remains an important export advantage and that the skilled labour necessary to sustain this sector, assuming no other demands, is adequate and likely to remain so. However, it is dangerous to rely on resource exports alone. The commodity markets, including those for energy, are notoriously volatile and sudden price changes can and have chilled the Canadian resource sector. Moreover, Canada certainly does not have a monopoly on resources, including energy. Russia, alone, is an important resource competitor.

It has long been a public-policy goal to encourage the diversification of Canada's exports in order to avoid the inherent instability of the resource sector and to enjoy a full-featured technologically-intensive state. Indeed, this diversification has happened to a major degree, exactly as prudent economic management called for.

Recently, however, this progress towards greater diversification has halted. Fuelled by rising demand from the global economy, Canada's resource exports have grown strongly, and manufactured exports, burdened by the Canadian dollar, have weakened. While this pause in export diversification is understandable in the circumstances, a major sustained shift away from a diversified export base must be seen as unwelcome to the stability and prosperity of the Canadian economy.

Of course, the only sustainable way to guard the diversification of our export base, never mind to improve it, is to increase Canada's educational advantage. When uncontrollable circumstances cause other export advantages to fade, the education and skill set of Canadians remains firmly within Canada's power to improve.

It must be reiterated that such countries as India, China and Ireland have used education to create or increase their export advantage. Clearly, China is massively increasing its educational facilities as part of its strategy to advance its economic strength and export power.

Canada has no choice but to play the same game. With its limited population base, it needs to play the game very well, applying its focus and resources as carefully and precisely as possible.

The polytechnics are already positioned to play a central role in this effort to take Canada's education strength to a higher level.

Of course, all the players in the Canadian educational system must rise to these new challenges. The elementary schools must redouble their efforts to improve literacy, numeracy and a love of learning. The secondary schools need to engage their students more effectively and reduce Canada's dangerously high drop-out rate. (Young persons without secondary-school graduation typically face marginal employment prospects.) The colleges and universities also have their part to play.

The polytechnics of Canada must be in the forefront of this campaign to strengthen the country's educational skill set. Indeed, the polytechnics are *already* responding to the educational competition from other countries.

First as we noted above, although Canada leads in proportion of post-secondary graduates, the relative number of degree holders and the number of years of post-secondary education are below those of other countries, and in particular those of the U.S. In response, the polytechnics are increasing the content and length of their

The Role of the Polytechnics

programs and offering programs that lead to applied degrees. Moreover, they are planning to increase their degree programs, as support allows. These initiatives directly address the deficiencies in program duration and degree attainment already noted.

Second, as an accompaniment to their degree programs, the polytechnics are increasing and strengthening their applied-research activities. This is essential in order to attract and develop the caliber of faculty necessary for more sophisticated programs of study. Research experience is also invaluable for senior students, given the importance of innovation as a response to fierce competitive pressure. In addition, the research can directly help Canadian enterprises to compete.

Third, the polytechnics are concentrating their efforts on exactly those skills that underpin global competitive success; technical and business skills. Indeed, more than 60 percent of the graduates are in these two key areas. And almost all of their degree programs are in either technology or business. In fact, the technical orientation is relatively higher than that of the other categories of post-secondary institutions in either Canada or the U.S. It is hard to imagine an approach more targeted to the needs of an internationally-competitive marketplace.

Moreover, we must remind ourselves that the polytechnics are accomplishing all this while simultaneously providing ongoing training to about one percent of the employed labour force of Canada each year.

Fourth, the polytechnics have very close relationships with Canadian enterprises. This gives them an intimate and immediate understanding of the every-shifting needs of the marketplace. The value of this knowledge and the ability to respond quickly cannot be over-emphasized. Institutions without this degree of feedback are greatly disadvantaged. In this regard, Canada's polytechnics may have a key advantage over their many foreign competitors. For example, societies such as China and India have less-experienced business communities and less of a tradition of close collaboration with

them. As a result, educational institutions in these countries may adapt to new skill demands more slowly than Canada's polytechnics.

Indeed, it appears that many foreign educational institutions often offer a rigid curriculum, emphasizing technological detail and minimizing marketplace context, integration, project management, communication and innovative problem solving. The polytechnics already know that experienced Canadian executives in dynamic industries want a broader, more balanced approach. This clearly suggests that the polytechnics are building their strengths in areas where some of their competitors are weak.

The polytechnics also have a strong advantage over the U.S. and its non-degree institutions. As the above research noted, these American institutions are relatively more limited in their scope and profile than the Canadian community colleges. Consequently, this suggests that Canada's polytechnics, with a high profile among the country's community college system are better suited to attract the superior students who are looking for a more extensive, yet applied, education. This, in turn, adds to the quality of the polytechnics' graduates' skill set and ability to compete.

With respect to universities in Canada and the U.S., the polytechnics also enjoy several advantages. While universities in both countries will continue to make important contributions to their respective economies and to the knowledge of humanity, they face limitations in their ability to support international competitiveness.

For example, since the universities quite rightly serve a broader social mandate, they cannot focus on technology or business skills as intently as the polytechnics. The budget and attention of the universities is pulled in many different ways simultaneously, making it nearly impossible to emphasize a few high-priority skills. In addition, universities typically do not have the depth of business relationships that the polytechnics do, and they are inherently not structured to make rapid decisions in response to such information.

The Role of the Polytechnics

While the broad Canadian college sector can respond faster than the universities, the polytechnics are best positioned to respond with the level of advanced skills that the global economy demands.

Considered overall, the polytechnics play a unique and indispensable role in guarding and extending Canada's export competitiveness.

The polytechnics are ensuring that Canada's labour force remains one of the best educated on earth and that it is being educated in a way that most closely meets the requirements of the future. With their strategic focus on technical and business skills and their sensitivity to marketplace needs, the polytechnics are unique in their ability to respond quickly to the ever-shifting need for advanced forms of applied education. Such responses are essential for Canada to meet the competitive pressures arising on multiple fronts.

The polytechnics are already serving this need. With greater public and government support, they can lead the way in creating the best-educated, most-skilled and most-flexible workforce in the world.

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