

# A Profile of Master's Degree Education in Canada

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## Executive summary

The master's degree, as a component of graduate education, has emerged from the shadow of the PhD. It is receiving increasing attention both from researchers and academic authorities eager to discover and promote its specific benefits, and from critics pointing out its flaws. This attention has been fuelled by the recent transformations in the nature of master's-level education both in Canada and around the world: changes in the way universities are responding to elements such as the labour market, the academic funding environment, global trends, student needs, public perceptions, and the shifting demographics of graduate students. What is clear in all of this is that master's education can be many things to many people, and this immense diversity of purpose and design is both its greatest strength and its biggest weakness.

The current study examines master's education in Canada by placing it within an international context and examining national and regional trends and challenges. A literature review was conducted to identify global developments. Interviews were conducted with representatives of graduate studies offices and with program directors in Canadian universities to identify emerging issues related to master's degree programs. The study also identifies a number of innovative programs in Canada to exemplify the main trends in master's-level education. Finally, quantitative data from Statistics Canada on Canadian master's programs were analyzed. The findings provide insight into the state of master's program enrolment and funding, and the demographic characteristics and employment status of master's students in Canada.

Probably the most significant global trend is the proliferation of professional programs. These programs are aimed at students who wish to enter a particular field directly after graduation or who want to enhance their professional credentials, and they are increasingly being designed with explicit input from industry and professional organizations. Stakeholders' perceptions of master's programs around the

world are important: while the master's degree was frequently seen as merely a bridge to the PhD, particularly in the natural sciences and engineering, this perception is beginning to change with the growing recognition in several countries of the value of master's-level training to both students and employers. In many European countries, the Bologna process introduced master's-level education with the aims of increasing student mobility and of providing professional and academic degrees whose value is recognized throughout Europe.

The emergence of multi-disciplinary, interdisciplinary and trans-disciplinary programs has been identified as one of the most significant changes in master's education in the international context. These programs reflect the growing need for students with multiple competencies and diversified knowledge. While it is true that many master's programs narrow their focus to a very particular specialization, graduates of these programs are expected to have, in addition to their technical knowledge, strong professional competencies and research-based skills. Therefore, in traditionally research-oriented programs, emphasis is being put on professional development, ethics and other non-technical courses, while professional and vocational programs are becoming more likely to include research training.

In many ways, Canadian master's education is following international trends such as the growth of multidisciplinary and professionally-oriented programs with new requirements for completion. However, international developments are not having a direct impact on the establishment of programs in Canadian universities, which generally are responding to perceived needs in the local environment for professional or research skills that require special training.

Using data from Statistics Canada for 1994-2003, this report highlights some important trends. The major development of greatly increased enrolment in master's programs, particularly since 1999, is perhaps the most obvious and is



also evidenced by the growth in new master's programs in universities across Canada. Driving this demand is the need for highly-skilled graduates in professionally-oriented disciplines such as business and management, architecture, engineering, mathematics, and computer and information sciences. Education and humanities disciplines have seen decreases in master's-level enrolment.

The predominance of women in undergraduate and master's-level education is a relatively new development, which started in the mid 1990s. Over 6% more women than men are now enrolled in Canadian master's programs. There is also a regional element to this trend: the ratio of women to men in master's programs is greater in British Columbia and the Atlantic provinces than elsewhere in Canada.

Full-time master's-level study continues to predominate in Canada, and there are indications that it will increase, as fewer part-time students are enrolling in master's degree programs. This is the case for all fields except the business- and education-related fields, most probably because a higher proportion of students in education and business have already joined the workforce and are re-entering the academic world for professional development. The emphasis on career prospects is probably less of a priority for students in the liberal arts and sciences disciplines.

Another development is related to the increase in the number of international students enrolling in Canadian master's programs. Their enrolment growth rates far exceed those of Canadian students, and 40% of the women enrolled in master's programs in Canada have international student status. International students are more likely than the national average to enrol in programs with a professional orientation, such as business, science and technology, and are less likely than the national average to enrol in programs related to the humanities, arts, health or education.

Data on master's graduates from Canadian universities and postsecondary institutions were examined in order to determine their demographic features. The number of master's graduates has increased by 36% since 1994,

with a spike in growth since 1999. There are more women graduates than men. There are more graduates aged between 25 and 29 at graduation than graduates of any other age group. About 12% of master's degrees were conferred to international students, and there was a greater increase in the graduation rates of international students relative to Canadian students.

Two-thirds of the students that graduated from master's programs obtained their degrees from institutions in Ontario or Quebec. Regional data also revealed that, after Ontario and Quebec, the Western provinces produce the most graduates. The data also suggested that demand for master's-level education is growing strongly in Alberta and Nova Scotia, which experienced the greatest rates of growth in graduation.

It was found that there are more professionally-oriented degrees conferred (near 70% in 2003) than liberal arts and sciences degrees. Professionally-oriented degree programs include those in business and management, education and engineering. A similar division can be seen in the US data.

Representatives from Canadian universities are optimistic about the current and future state of Canadian master's programs. According to them, master's-level education is strong in Canada, and Canadian universities have, and will continue to have, a strong tradition of research-based master's degrees. At the same time, professional master's degrees are playing an increasingly important role in the Canadian workplace by responding to increased expectations and demands from employers.

Canadian universities face some important challenges, including funding for both programs and students. Despite a high completion rate at the master's level, reducing time to completion was identified as very important. Also important is to bring Canadian institutions together to increase the recognition of Canadian master's education, particularly the professionally-oriented and non-thesis master's programs. It is becoming increasingly urgent to develop more stringent certification processes for non-thesis programs. ■



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# 1 Introduction

Master's-level education favours in-depth studies leading to greater understanding of a particular field of study and is an opportunity to develop research, professional and vocational skills. It has traditionally served as the entry point to doctoral education. This segment of graduate studies has received increasing attention in recent years and is considered to be an important component of the educational and professional development of nations. While graduate education researchers and administrators have traditionally focused on doctoral education, there are important developments occurring at the master's level that make the present examination particularly worthwhile.

A study entitled *A Silent Success*, commissioned by the Council of Graduate Studies (CGS) in the early 1990s that focused on master's degrees in the US, demystified the popular perception that master's degrees were "second-class" degrees or consolation prizes for graduate students who did not engage in doctoral studies (Conrad, Grant Haworth and Bolyard Millar 1993). In fact, the study revealed that the experience of master's students was, to a great extent, positive and inconsistent with the negative assertions commonly found in the literature. Dr. Debra W. Stewart, president of the CGS, recently revisited the master's education landscape in the US and concluded that the success of master's education "now speaks eloquently, about the reach, the enormous value, and broad influence of graduate education".<sup>1</sup> Dr. Stewart encourages academic stakeholders to endorse the value of the master's degree and to view it as an independent entity within the spectrum of graduate studies. Master's education, with its rapidly developing areas of specialization, should be considered as a national asset in training thousands of students who will contribute to society as critical thinkers, researchers and experts.

Almost all the stakeholders interviewed in the course of the present study also spoke highly of the contribution of master's programs to Canadian society and argued that, in Canada, master's degrees play a much more important role than in the US not only as a tool to train students as researchers, but also as a legitimate and worthwhile indication of a student's willingness to embark on a rewarding career. They mentioned that the master's degree plays a key role in a society seeking lifelong learning and self-fulfilment.

A few years ago, the Canadian Association for Graduate Studies (CAGS) initiated an inquiry into the status and evolution of master's programs in Canadian universities. This report stems from CAGS' motivation to understand the changes affecting these programs and to be better equipped to respond to them.

The report examines global trends affecting master's programs from an international perspective using publicly available literature to contextualize the evolution of master's programs (Section 2).

This is followed by a detailed examination of trends and challenges in master's education in the Canadian context (Section 3). In addition to academic literature, grey literature and official statistics, interviews were conducted with representatives of graduate studies offices to capture some of the important events in master's-level education over the last decade. Program managers were interviewed to collect information about current practices at the master's level in Canadian universities.

Section 3 also explores quantitative data on master's programs and student populations, primarily from Statistics Canada surveys. Demographic characteristics including gender, ethnicity, and age are examined. An overview of the funding available to master's students is provided and, finally, a cost-benefit analysis of master's education compared to other levels of higher education is included. ■

<sup>1</sup> Keynote address at the annual Graduate School Faculty Workshop held on October 3, 2001 at Penn State University.



## 2 Global trends

This section describes how international and regional trends are changing the way universities develop and modify master's-level programs.

It should be noted that the majority of the new developments in master's degree programs discussed in this section have been in engineering, health-related disciplines (medicine; social work; psychology; nursing), education, communications and public relations. Few innovative programs were found in fields such as history, philosophy, astronomy, physics or the arts. This may reflect the limitation of the sources of information available to inquire about the evolution of higher education systems. Indeed, the information for this study came, in large part, from academic journal articles describing particular programs, including such journals as the *Journal of Professional Issues in Engineering Education and Practice* and the *Journal of Professional Nursing*.

The absence of professionally-oriented journals in other fields might explain why the literature review did not capture developments in these fields. An alternate hypothesis is that demands from industry and evolutions in the liberal professions drive the development of master's programs, while these concerns might be less overriding in more fundamental or academic fields. This is partially confirmed by the observation that the most important international trend at the master's level seems to be the development of professional and vocational master's degrees, often addressing lifelong learning needs.

### 2.1 Multidisciplinarity, interdisciplinarity, and transdisciplinarity

An important trend affecting university programs, including master's degrees, is the growing emphasis on multidisciplinary, interdisciplinary, and transdisciplinary studies. In practice, the

boundaries between these concepts are often blurred and the terms are often used interchangeably. However, there are subtle distinctions that make definition worthwhile.

#### Key definitions<sup>2</sup>

*Multidisciplinarity* involves a variety of disciplines but without integration of concepts, epistemologies or methodologies.

In *interdisciplinarity*, concepts, methodologies and epistemologies are explicitly exchanged and integrated.

*Transdisciplinarity* is a specific form of interdisciplinarity in which boundaries between and beyond disciplines are transcended and knowledge and perspectives from different scientific disciplines as well as non-scientific sources are integrated.

Multidisciplinarity is manifest in two principal ways: disciplinary programs with multidisciplinary additions, and multidisciplinary degrees per se. An example of the latter is the Master's Program in Computational Engineering taught at the University of Erlangen-Nuremberg. Courses within the program are taught by professors from departments from outside of the faculty of engineering (Ruede 2002).

The distinctive feature of multidisciplinarity may not be found in the composition of programs but rather in the goals that were set when the programs were designed. For instance, like many emerging fields, public relations is multidisciplinary, comprising elements of journalism and mass communication, business management, rhetoric/cultural/communication studies and liberal arts. But the need for interdisciplinarity is more obvious when considering what is expected of those who complete these programs, which is presumably more than the competencies gained from the study of the individual disciplines. In an "ideal" public relations master's degree program, graduates are expected to develop a "global perspective",

<sup>2</sup> Adapted from <http://www.bio.vu.nl/vakgroepen/bens/HTML/transdisciplinair.html>



become socially responsible, contribute to the profession, be responsive to diversity, and pursue continuing education (Russell 1999). Similarly, in engineering, non-technical courses are added because of an increased concern for providing students with courses that address the ethical, social and/or environmental issues related to the work they will be doing (Nowatzki 2004).

## 2.2 Professionally-oriented programs

Master's degrees have sometimes been seen as stepping stones to doctoral programs. As such, they provide a means to equip students with writing skills and act as a screening process for applicants to doctoral programs (Hallam 1998; Jensen 1999). This situation is reinforced in some fields, such as psychology, by the fact that a doctorate is required for professional accreditation (Lowe Hays-Thomas 2000). Further, the value of a master's degree on its own has been debated. For example, in the natural sciences and engineering, those who hold only master's degrees are sometimes thought to have failed in advancing to the doctoral level (NSF 2004). However, the economic value of some master's degrees seems to be increasing, particularly professional master's degrees. Hallam (1998) argues that MSc students in agricultural economics receive salaries similar to those paid to assistant professors. The evidence suggests that a number of professional master's programs worldwide are targeting both students finishing their first degree who are looking for a program that will enable them to enter the market and working professionals seeking to enhance their career possibilities through further education.

European institutions have made efforts to officially differentiate academic and professional degrees. This differentiation is seen as important because it may affect prerequisites for program entry, possibilities brought about by the degree (other degrees it may lead to, if any), and the title afforded by the degree. For instance, program administrators in Austria plan to develop advanced master's degrees that are professional in nature but do not provide access to a doctoral

degree. In France, the distinction and choice between academic and professional degree programs is very important. In general, only research master's degrees can lead to admission to doctoral degree programs, though some options exist for access to doctoral studies with a professional master's degree (EUA 2002).

Implementing a professional master's degree program often starts with establishing entry requirements that are flexible and recognize professional experience (Russell 1999). For instance, nurses may take a master's course to become nurse practitioners, midwives, nurse administrators, educators or informatics specialists (Kaplan, Rosenfeld and Haber 2003), or bachelor's degree graduates may enrol in an accelerated master's degree program designed to allow them to teach in their discipline (Post *et al.* 2004).

Universities sometimes offer shorter professional programs that include master's-level course work but that lead to a postgraduate diploma rather than to a master's degree. For example, the University of Southern California offers a Certificate in Astronautics, which is aimed at professional engineers and scientists who want to acquire accelerated training in space-related fields (Gruntman *et al.* 2004; see also Schoon and Sandoval 2000).

Another important initiative is the development of a short-term, "available for a limited time" type of master's degree, such as one in nursing created for rural areas in the American Midwest. This type of master's-level program was developed to answer an isolated need for further education in nursing. Two two-year programs were established, recruiting two student cohorts. This example illustrates the fact that master's programs can be designed to answer *ad hoc* needs with no requirement for long-term continuity (Block *et al.* 1999). It is interesting to note that this master's degree, like others (see Dodds, Laraia and Carbone 2003; Tornatzky, Waugaman, and Gray 2002), was established after the completion of a market study to identify potential clients.



In Australia, there has been a surge in the popularity of professionally-oriented (or what are referred to in that country as 'coursework') master's degrees, and this increase is almost exclusively among international students (Table I). Marginson (2001) describes these programs as resembling shorter master's degree programs that answer the vocational needs of industry, sometimes at a pedagogical level that is not that much higher than that of the bachelor's degree.

Table I Master's enrolment in Australia, by disciplinary field, and type of program, 1999

Field	Master's (research)	Master's (coursework)
Business, Admin.and Economics	691	23,990
Science (incl. Computing)	1,797	4,285
Arts, Humanities & Social Sciences	3,624	7,512
Engineering & Surveying	1,134	2,246
Health Sciences	953	6,657
Architecture & Building	283	696
Education	1,135	7,398
Law & Legal Studies	137	2,151
Agriculture	388	191
Veterinary Science	55	69
Non-award courses	0	0
<b>All fields</b>	<b>10,194</b>	<b>55,176</b>
<b>% All fields</b>	<b>15.6%</b>	<b>84.4%</b>

Source: Marginson 2001 (DEST)

Between 1995 and 1998, the number of international students doing coursework master's degrees increased from 2,270 to 6,313, while the number of international students in research master's programs fell from 316 to 282. In addition, the number of domestic students in Australia entering coursework master's programs increased by 5.3% between 1995 and 1999, while the number of international students grew by 250% over the same period.

Marginson thus concludes that coursework master's degrees have become the principal means for the commercial expansion of international education in Australia. In 2004, overall data on enrolment in master's programs show that coursework master's programs represent nearly 95% of all Australian master's enrolments

(Australian Department of Education, Science and Training). This international marketing strategy has produced expected outcomes over the last decade. The clientele of Australian master's programs has become significantly more international. Indeed, the proportion of international students enrolled in master's programs rose from 12% in 1992 to 45% in 2001 (Figure 1).

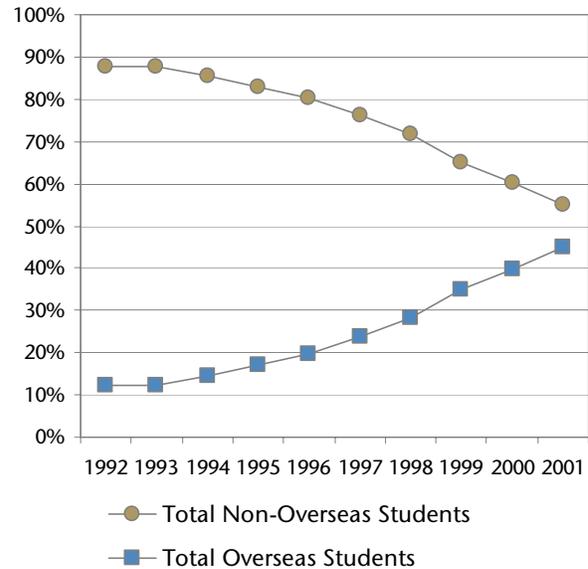


Figure 1 Master's enrolment in Australia, by immigration status, 1992 to 2004

Source: Australian Department of Education, Science and Training (DEST)

### 2.2.1 Multidisciplinary aspects

Multidisciplinary is often present in professionally-oriented master's programs (Gail *et al.* 2004). It has been suggested that one of the factors contributing to the increased need for multidisciplinary at the master's level is the greater importance given to ethical concerns. There is growing pressure for programs to encourage students to become responsible researchers and highly qualified professionals through the provision of ethics and social sciences courses. For example, some master's programs are targeted at general practitioners in medicine who want to orient themselves towards an academic career in subjects such as ethics, sociology of



health and management (Smith 1994). The Master's in Public Health degree programs, which instructs future health practitioners in preventive medicine, community health, and the use of media and other communication to promote public health measures, is another example of a multidisciplinary program with a social and ethical focus (Hoffman-Goetz and Dwiggins 1998; Kaplan, Rosenfeld and Haber 2003).

Similarly, the Master Builder Program offered by Worcester Polytechnic Institute (MA, USA) is an example of a multidisciplinary professionally-oriented master's program. This engineering program integrates lessons from ethics, law and management while accommodating the needs of working students. The program also distinguishes itself from other civil and environmental engineering programs in its approach to industry participation. To ensure the practical orientation of the program, local industry actors are involved through study projects, adjunct professor positions and guest lectures. An industry advisory committee has been set up to help develop opportunities for increased industry participation in the program (Albano *et al.* 1999).

### 2.2.2 Taking stock of industry needs

Professional master's programs demonstrate that the master's degree is a valid end point, a bridge to the labour market and a means of fulfilling the further education needs of working professionals. The development of professional programs is encouraged by the interest they have engendered in industry. For instance, in the US, enterprises are increasingly looking for employees with a strong scientific background, but who are less specialized than doctoral graduates (Jensen 1999). Their need for multidisciplinary, professionally-oriented workers is reflected in the following quote: "Companies today need 'information engineers': not simply software engineers, computer engineers, or even business administrators, but all of these combined" (Callahan and Pedigo 2003).

In Japan, industry has been putting pressure on universities to train greater numbers of creative and dynamic graduates (Doyon 2001). Companies have increasingly been encouraging science and engineering graduates to do a master's course before applying for jobs. This has created a demand for specialized master's-level courses and rewards for those who undertake them and has increased the importance of graduate education for professional development.

Some professional master's courses are developed in close collaboration with corporate executives to ensure that they meet the needs of industry. For example, a new master's course aimed at the information technology (IT) industry was developed at the University of Alabama with the explicit aim of meeting the continuing education needs of that sector (Callahan and Pedigo 2003). The program aims to complement the training of employed IT engineers with management and business skills to increase their appreciation of what is required of their designs. The program is designed to accommodate the schedules of IT industry workers: tuition is provided monthly on Fridays and Saturdays, thus providing a balance between employers' and employees' time.

### 2.2.3 Liberal professions

While the emergence of professionally-oriented master's degrees may be new in some fields, degrees in the liberal professions<sup>3</sup> have always been closely associated with practice. This does not mean that master's degrees in these fields have not changed. For instance, a recent article by Edward A. Nowatzki (2004) raised the issue of increasing the educational requirements for

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<sup>3</sup> The liberal professions can be defined as occupations requiring special training in the arts or sciences. These include lawyers, notaries, accountants, architects, engineers and pharmacists. Across the EU, the professions are subject to regulations such as fee scales, advertising restrictions, exclusive rights and rules prohibiting inter-professional co-operation. (European Commission, DG Competition)



practising civil engineering in the US to a master's degree. The author proposed a structure composed of three years of pre-engineering followed by an additional three years of master's-level training at an engineering college. The training would emphasize particular issues, such as environmental ethics and social responsibility. Students completing the program would be granted an official, state-recognized licence to practise. Nowatzki's proposition highlights how the internal dynamics of a profession may affect the perceived role of the master's degree, in this case by increasing the multidisciplinary content and making it an instrument of official recognition. Master's degree programs may also be influenced by a desire to comply with the guidelines established by various professional organizations. (see also Trahan and McAllister 2002).

Just as master's programs are created or adapted to meet industry needs, their evolution is also influenced by professional associations that cooperate with universities to tailor programs to the needs of professions. This occurred in Australia, where the National Institute of Accountants worked with the University of New England to establish the Master of Commerce (Professional Accounting), a distance-learning program. A competing school also makes professional accreditation an important part of its accounting program. In some European countries, cooperation with professional bodies in the development of a new curriculum is a legal requirement for program accreditation (UNESCO 2003).

Larson, Chandler and Forman (2003) found evidence that MBAs are becoming more popular in the medical profession. The authors surveyed 125 allopathic medical schools in the US and found that in 2001, 33 offered dual MD/MBA programs and 17 were considering offering them in the future, while in 1993 only six schools offered such programs. The authors concluded that the growth in the number of MD/MBA programs and students

suggests that there is rising cooperation between medical and business schools, and more graduating physicians are interested in management education early in their careers.

#### 2.2.4 Potentially detrimental effects

UNESCO noted that employability has recently occupied a bigger place in the European discussion on higher education; in addition, some countries are concerned that the bachelor's degree might be too oriented towards "short-term employment in a particular profession". UNESCO also contends that though many professional master's degrees are designed to make graduates more employable and are becoming more closely linked to the labour market, they are weak academically. UNESCO believes that the "mushrooming" of new degrees closely associated with the labour market generates some tension in the academic recognition of qualifications and in the traditional system of academic values (UNESCO 2003).

### 2.3 Distance education and e-learning

It is important to distinguish between distance learning, which is learning that takes place when the teacher and the student are in different physical locations, using media such as written correspondence or video broadcasts, and e-learning, which utilizes a network (LAN, Internet) for delivery, interaction, or facilitation. E-learning may be delivered at a distance, although it may also be used in on-campus courses.

Although some question the efficiency of distance learning, this type of delivery caters to the needs of professionals with work and family obligations and those living far from university centres (Gruntman *et al.* 2004). A number of examples illustrate how distance learning is used at the master's level:

- The Professional Practice Program in Nutrition (PPPN) at the University of North Carolina at Chapel Hill uses distance education in its Master's



Degree in Public Health (MPH) program and reveals that distance education does not preclude human contact. This program uses online courses through the Internet and interactive video-conferencing, but also uses seminars and face-to-face interaction with teachers (Dodds, Laraia and Carbone 2003).

- Similarly, Hong Kong Polytechnic University's Master of Science/Postgraduate Diploma (MSc/PgD) program uses a combination of face-to-face courses and distance learning. The program is delivered by the Hong Kong Polytechnic University at the Chongqing Jianzhu University, a partner university in mainland China, and teachers will travel to the University to deliver some of the courses. Students are full-time professionals, sometimes working far from the university, and lecturers have other duties, making the combination of delivery modes ideal (Wong, Shen and McGeorge 2002).
- The Master of Education in Mathematics at the University of Newcastle, Australia has some courses that are available both on campus or through distance learning.
- The Master of East European Studies program from the Freie Universität Berlin uses compulsory distance learning for one of its five courses, thus showing that distance education can be partially implemented.
- The Postgraduate Diploma in Theology, the Postgraduate Diploma in Ministry, and the Master of Ministry degree at the University of Otago, New Zealand demonstrate that distance education touches upon a wide range of disciplines—not only professional degrees.
- The MBAs offered through distance education by the University of Leicester in England may take from two to five years, thus showing that some of the programs delivered through distance education provide one way of supporting part-time studies.
- The Master of Science in Forest Industry Technologies at the University of Wales, Bangor establishes that while master's degrees targeting working professionals and using distance education are often composed entirely of coursework, this does not necessarily preclude the completion of a thesis.

## 2.4 New requirements for completion

The requirements for completion of master's degrees are evolving rapidly. Completion times and rates of success have been shown to be problematic in some fields at the master's level (CAGS 2003). Changing the type of work to be accomplished within a master's degree is one means of addressing such problems. Replacing the traditional master's dissertation by additional courses or internships are common examples of these changes. Coursework master's degrees are generally becoming more popular, as evidenced by Marginson's study (2001) in Australia.

Another example of changing requirements is provided by the Department of Civil Engineering at the Rose-Hulman Institute of Technology in Terre Haute, Indiana, which has replaced the thesis component of its Master of Science in Environmental Engineering with a service learning design course. This course involves a real-world project for a non-profit, community organization. The department believes that this greatly benefits the students, putting them in a situation where they must deal with real clients. Training on project management, communication and ethical frameworks is immediately put into practice (Talbert *et al.* 2003).

Changing the requirements for completion does not always mean substituting other items for the master's dissertation. For instance, both an internship or study project and a master's thesis are required to complete the East European Studies Master at the Freie Universität Berlin.

What is certain is that there is a wide variety of requirements for obtaining a master's degree. For instance, Briggs and Fleming 1994 found that master's programs in journalism and mass communication are a "diverse group ... with admissions criteria, content, and graduate requirements differing among programs in response to different goals, the needs for a diverse clientele, and competition for students" (cited in



Aldoory and Toth 2000). In a review of 26 public relations programs in 21 universities, Aldoory and Toth (2000) found a significant lack of consistency between programs. There was no required course common to all 21 universities in the sample. Requirements, number and types of courses, electives, and the requirement of a thesis, professional project or final exam varied from one program to another.

## 2.5 Dual degrees and joint degrees

Dual-degree programs are studies that lead to two or more distinct, although often complementary, degrees. Joint-degree programs describe one or more degrees delivered jointly by two or more institutions. A number of initiatives have sprung up around the world, a few of which are described here.

Joint degrees are awarded special importance in Europe:

*Developing European Joint Degrees at these levels, jointly awarded by several European institutions, could become a hallmark of excellence of the European Higher Education Area. Studying in structured programmes that offer learning opportunities in another institution and country stimulates new ways of thinking and generates a wealth of new cultural opportunities, including the possibility to develop and extend language-learning skills and being exposed to new learning methods. Working with students and professors in multi-cultural environments enhances experiences of European culture and extends pan-European social and technological knowledge. Developing permanent network links across Europe assists future employment prospects and, in this context, graduates' CVs have considerable "added value". There is no doubt that such learning experiences change lives, broaden intellectual horizons and offer new professional perspectives (EUA 2004: p.14).*

Joint programs are also said to offer opportunities for teacher exchanges, which contribute to professional development, help create new contact

networks, open up possibilities for research collaboration, and encourage contacts between various academic traditions (EUA 2004). Joint degrees, however, are not widely recognized. They are often recognized only in one country, with partner countries issuing additional certificates. Joint degrees also face funding problems since initiatives rarely target joint degrees specifically but instead address broad goals such as encouraging mobility. There are also accessibility problems, since most joint master's programs entail much higher costs for students than normal master's degrees. This situation might reduce the access of students from certain countries and/or socio-economic backgrounds. Another obstacle is that of quality assurance in creating and assessing joint master's programs (EUA 2004).

Examples of joint degrees and dual degrees abound. The University of Hamburg (Germany) and the University of Fudan (China) offer a joint dual Master/MBA of International Business and Economics–China Focus. The program is delivered over three semesters, two of which take place in Hamburg (leading to the master's) and one in Shanghai (leading to the MBA). It is also multidisciplinary, combining economic theory and management practices and tools with Chinese political and cultural studies. A joint master's degree in Transport Studies is being offered by Western Australia's four public universities. Students enrol at the university where their research project takes place, but all four universities participate in the delivery of courses.

The Postgraduate Scheme in Occupational Safety and Health (POSH) is offered in Hong Kong by the University of West Sydney, in collaboration with the Hong Kong Polytechnic University. This program leads to a dual Graduate Diploma in Applied Science in Occupational Health and Safety and a Master's in Applied Science in Safety Management. It is important to note that in this case, completion of the graduate diploma is a



prerequisite and is followed by the Master's. The scheme is professionally-oriented, aiming to provide students with the skills needed to make occupational safety and health a career specialization. The degree course also develops students' abilities to conduct independent research. The program is delivered partially through distance learning and partially through lectures and workshops, and it culminates in a year-long, workplace-based project.

The Erasmus Mundus Master of Nanoscience and Nanotechnology uses joint master's arrangements to achieve multidisciplinary, using the strengths of each of the four participating universities: Katholieke Universiteit Leuven (Belgium); Chalmers Tekniska Högskola (Sweden); Technische Universiteit Delft and Universiteit Leiden (the Netherlands); and Technische Universität Dresden (Germany). For example, the Chalmers University (Sweden) provides courses on nanotechnology and nanoscience, while the University of Dresden (Germany) provides courses on biophysics and bionanotechnology. The program lasts two years. Students must choose two universities and study for one year at each, after which they are awarded a double degree. The program includes a master's dissertation and is taught in English.

Many universities are offering master's degrees in overseas countries, often in collaboration with a local institution. Such a phenomenon can be explained, according to the AUCC (2003), by an increasing demand for higher education worldwide, coupled with limited capacities in many countries. This trend is creating a global higher education market. Many universities are using the opportunities offered by this new market, most notably those in Australia, which seem to have a long tradition of offering courses in East and South Asian institutions. The University of New South Wales, for instance, has been offering courses in mainland China since the 1990s (Xia 2002). Another example is the Rochester Institute of Technology (RIT) which offers an Executive Leader Master of Science course in

Packaging Science, a course that is designed and originates at the RIT but is delivered at the University of Zagreb (Goodwin and de Winter 2000).

An important element of many of these new master's-level degree courses is that they are delivered in English regardless of the native tongue of the country in which they are being taught. The aim is to make the local clientele fluent in English and/or to attract international applicants.

## 2.6 Standardization of structures and promotion of mobility: the Bologna Process

There are a number of challenges resulting from the trends towards program variability and student mobility that in the European context are being addressed through a bold effort known as the Bologna Process. The Bologna Process has attempted to systemize recent efforts to increase comparability between countries and increase academic and professional recognition of qualifications across Europe. In many countries, the structure of higher education has been altered to fit a new European standard. This has generally involved moving away from the traditional one-tier structure, characterized by four or five years of study leading to a diploma that is roughly equivalent to a combined bachelor's and master's degree. Instead, what is being embraced is the two-tiered model in which the bachelor's leads to the master's degree.

To ensure comparability, the ECTS credit system has been established. This system assigns credits to a course based on a required student workload. A credit would normally represent 25 to 30 work hours, and a semester would normally be composed of 30 credits. So far, it appears that the dominant trend in Europe is to develop two-year master's programs (120 ECTS credits) following three-year bachelor degrees (180 ECTS credits). Some master's programs currently last only one year (60 or 90 ECTS credits) (EUA 2003). In addition, the Diploma Supplement is an official,



standardized document which provides information about the degree obtained. This information pertains to the holder of the qualification, to the qualification itself and to the national system of higher education that delivered it. The Diploma Supplement thus aims to provide complete, clear and accessible information about qualifications to ensure maximum recognition by parties outside the countries involved.

The Bologna Process has had a significant impact on master's-level study in Europe. Essentially, for many countries, it is establishing master's education. With the introduction of the two-tier system, there is a need to distinguish between the old diploma-type programs and the new master's degrees. Most European countries have responded by introducing the title of "master's degree". Older degrees keep their traditional appellations. The most commonly encountered exception is the liberal professions programs, such as medicine, where the older structures are often kept, sometimes with new degree names (EUA 2002).

The Bologna Process has its detractors who have raised questions about its effect on the quality of study. Some believe that the Bologna Process is seen as a by-product of neo-liberalization, with associated dangers for education (Amaral and Magalhaes 2004; Neave 2003). Another concern is that students and employers might interpret the abolition of the diploma formula as an incentive to stop at the bachelor's degree (although it is anticipated that the majority of students will continue on to the master's level). Worries about students potentially graduating with only a bachelor's degree are being compounded by the fact that the bachelor's degree is considered by many to have little relevance for industry and is therefore seen simply as a means of access to the master's degree (Jeltsch and Nipp 2004).

By 2004/05, the two-cycle structure had been established in most *Bologna Declaration* signatory countries. Master's degrees are now offered in almost all fields of study in Europe (EC - Eurydice 2005). ■



### 3 Master's education in Canada

This section examines data on the distribution of master's programs in Canadian universities. Canadian university and postsecondary institution enrolment data are examined in order to determine how master's-degree programs are distributed in universities across the nation, who enrolls in these programs, and what programs students were enrolling in between 1994 and 2003. These data are examined to shed light on important dimensions of the education system, such as gender, immigration status and age. These statistics were compiled by Science-Metrix using mainly four sources of data:

- Statistics Canada's Enhanced Student Information System (ESIS)<sup>4</sup>;
- Statistics Canada's 1996 and 2001 censuses;
- Statistics Canada's National Graduates Survey - Class of 1995, Class of 2000.
- AUCC Directory of Canadian Universities (DCU)

#### 3.1 Changes in enrolment and graduation rates

When asked how the demand for master's programs had evolved within the last five to eight years, most of the university representatives interviewed reported a steady increase in enrolment and, more particularly, a great increase in enrolment from international students, impressions that were confirmed by the data from Statistics Canada.

In 2003, Canadian graduate enrolments totalled 142,765, corresponding to 14.4% of the total post-secondary student population. Those enrolled in master's programs represent the lion's share of the

Canadian graduate student population. Nevertheless, although the annual number of enrolments in master's programs has increased significantly over the last 10 years, the ratio of earned master's degrees to doctoral degrees has been fairly stable, and enrolment in master's programs has remained at around 62% of total graduate program enrolments.

In 2003, there were close to 90,000 students enrolled in master's programs in Canadian institutions, representing a 28% increase from 1994 (Figure 2). By comparison, enrolment in doctoral degrees was 31,449 in 2003, and this represented an increase of only 19% doctorate enrolment compared to the 1994 level. The highest enrolment increase experienced by master's programs was between 1998 and 2003, with an average annual growth of more than 4.7% (compared to 1.2% for the 1994–1999 period).

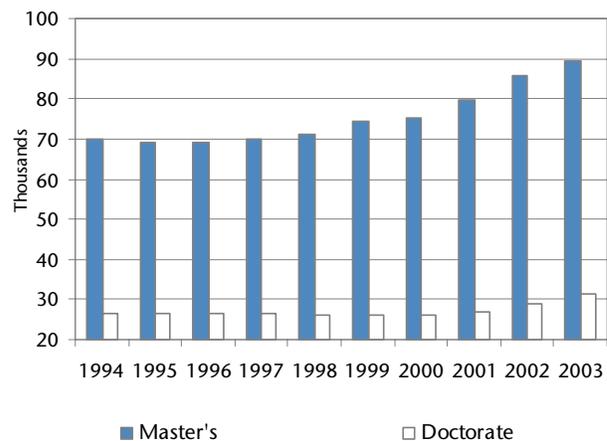


Figure 2 Graduate enrolment, by level of study, 1994 to 2003

Source: Compiled by Science-Metrix from data prepared by Statistics Canada (ESIS)

Increasing enrolment has recently been identified as one of the major challenges that universities will face in the coming decade. Projected estimates based on data from Statistics Canada reveal that there is likely to be a 20 to 30% increase in enrolment over the next 10 years (AUCC 2002). The high level of growth could be explained by the continual implementation of new master's

<sup>4</sup> The ESIS dataset has been entirely revised, adjusted and updated since the version used in OST-CAGS's Statistical Report 1990-2001. Because of these adjustments and updates, enrolments and graduation statistics vary somewhat compared to those published before the release of the updated ESIS dataset in October 2005.



programs over this period that are feeding the growing demand for second-cycle training from both students and employers. Graduate studies offices interviewed for this study affirmed an average of 10 new master's programs created in their respective universities since 1998, while very few reported terminating even one program.

This recent rise in master's enrolment coupled with the proliferation of new master's programs has necessitated rapid and continued adaptation on the part of university management and faculty members. Problems with space limitations and maintaining adequate numbers of teachers and supervisory staff have been experienced in some fields; in others, funding issues have actually blocked the progression of enrolment. In general, many of the university representatives interviewed for this report noted that their institutions have focused heavily on master's education over the last decade and are now at the stage where they are consolidating assets and evaluating the outcomes of the changes that were implemented.

As a result, some master's programs and master's-level certificate and short programs have recently been combined or merged. For more traditional or research-based master's programs, departments are attempting to streamline programs so that students can graduate faster. In some cases, the thesis is being replaced by an applied research paper or project that is shorter and more focused. Conversely, many programs that were originally course-based (or dissertation-based) are now offering students the option to do a thesis. Ultimately, universities hope that this will lead to the development of a research curriculum, and consequently, to new doctoral programs. Many of the graduate office representatives interviewed for this study felt that there will be an increased focus on the development and improvement of doctoral programs and their role in relationship to master's programs.

Canadian universities, in focusing their efforts on attracting the best students, generally employ recruitment strategies at the departmental level rather than adhering to an institution-wide approach. However, each region in Canada employs particular strategies for recruitment, depending on the number of universities in a province (both research-intensive and non-research-based universities) and other regional factors. Some of the interviewees noted that prestigious researchers are recruited in order to attract students. Some recruiting efforts focus instead on making programs attractive to potential students and updating programs in ways that will reflect changing demands.

Important differences can be observed among Canadian provinces when master's enrolment is examined geographically (Table III). Ontario and Quebec each accounted for about one-third of master's-level enrolment during the 2001–2003 period in Canada, whereas British Columbia and Alberta accounted for about 10% each.

The surprise here is Nova Scotia, where enrolment (4.9% of Canadian enrolment) is higher than in Saskatchewan and Manitoba (both around the 2.5% mark). The evidence presented in Table II confirms that Nova Scotia is an important player at the master's level. In fact, it had the greatest number of enrolled and graduating master's students and graduates per capita in Canada in 2003 (484 and 151 per 100,000 inhabitants, respectively). Quebec is another province where there is a large ratio of students per capita, while Manitoba and Prince Edward Island have the lowest density in Canada. The high growth rate in Prince Edward Island can be attributed to the catching-up phenomenon, or the fact that the province has the smallest number of master's graduates per capita but experienced a period of rapid growth in the educational sector which lessened the gap that existed between it and other provinces.



Table II Master's enrolment and degrees awarded, by province and per 100 thousand inhabitants, 2003

Province	Enrolment	Enrolment per 100k inhab.	Graduation	Graduation per 100k inhab.
NS	4,540	484	1,414	151
QC	28,956	386	9,003	120
ON	29,998	244	11,420	93
AB	8,239	260	2,322	73
NFL	1,584	305	373	72
BC	9,803	235	2,961	71
SK	2,300	231	610	61
NB	1,629	217	428	57
MB	2,226	191	469	40
PEI	112	81	18	13
<b>Canada</b>	<b>89,387</b>	<b>282</b>	<b>29,018</b>	<b>91</b>

Source: Compiled by Science-Metrix from data prepared by Statistics Canada (ESIS)

Reducing time to completion was identified as an important issue by several interviewees. It was noted that some master's students take three to four years to complete their degree programs. There are several reasons for this. Some students may actually wish to stay longer because there are teaching assistantships available and many master's students consider this time well spent. Other students may stay longer (up to an extra year) in order to produce original research for publication. Indeed, some interviewees suggested that another trend in master's-degree education

involves a change in its primary function: while it was once most concerned with introducing students to research techniques and practices, the focus has increasingly been on encouraging students to produce original contributions to a scientific field. Many of the deans interviewed suggested that more than ever before, students in research-intensive programs are publishing in peer-reviewed journals and participating in scientific conferences as presenters. In some natural science and engineering fields, master's theses are published in peer-reviewed journals. In addition, interviewees indicated that students who have had their research published are more likely to be admitted to a doctoral program and are more likely to receive funding for their doctoral studies. This trend has had a considerable impact on the scientific research output of faculty, thus improving the research capacity and reputation of Canadian universities and increasing the associated rewards.

The possibility of shorter time to completion, especially in relation to professional master's and course-based master's programs, has interested both students and employers. Even in the humanities, departments have been found to actively encourage the development of "condensed" programs.



Table III Master's enrolment, by province, 1994-2003

Province	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	$\Delta$ 1994-1998 & 1999-2003	% of Canada (2001-2003)
ON	23,298	23,189	22,813	23,430	24,016	24,797	25,307	26,469	28,762	29,998	16%	33.5%
QC	24,124	23,995	23,900	23,542	23,420	23,894	23,988	25,926	27,787	28,956	10%	32.5%
BC	7,717	7,798	7,927	8,134	8,585	8,826	8,785	9,354	10,160	9,803	17%	11.5%
AB	4,796	4,682	4,927	5,282	5,542	6,577	6,855	7,129	7,803	8,239	45%	9.1%
NS	2,764	2,633	2,587	2,655	2,952	3,330	3,636	3,864	4,198	4,540	44%	4.9%
SK	2,101	2,072	2,105	2,111	2,095	2,216	2,001	2,033	2,092	2,300	2%	2.5%
MB	2,503	2,372	2,227	2,121	2,074	2,096	1,941	2,020	1,908	2,226	-10%	2.4%
NB	1,430	1,382	1,287	1,241	1,305	1,299	1,362	1,364	1,542	1,629	8%	1.8%
NFL	1,023	1,151	1,292	1,306	1,286	1,229	1,242	1,286	1,429	1,584	12%	1.7%
PEI	27	26	30	30	18	67	80	90	118	112	256%	0.1%
<b>Canada</b>	<b>69,783</b>	<b>69,300</b>	<b>69,095</b>	<b>69,852</b>	<b>71,293</b>	<b>74,331</b>	<b>75,197</b>	<b>79,535</b>	<b>85,799</b>	<b>89,387</b>	<b>16%</b>	<b>100%</b>

Source: Compiled by Science-Metrix from data prepared by Statistics Canada (ESIS)

Providing “indirect access” to the PhD for students who have not formally completed a master’s degree has become an important concern for Canadian universities. Faculties of graduate studies are being urged to investigate the early inclusion of master’s students in the doctoral training process. Many universities have facilitated this practice. In these cases, students may transfer to a doctoral program without completing their thesis, although these students will have, at the very least, completed the required courses and formally presented their research interests. However, it has been noted that this kind of access is generally only available to exceptional students—those who have demonstrated great academic and research skills during the first year of their master’s program. This practice is employed to accelerate the training, time to completion and scientific contribution of students; it is also mostly confined to the natural sciences.

“Direct access” to a PhD program from a bachelor’s degree program has not been received enthusiastically in Canada. Faculty members appreciate the value of master’s training, as it enables them to clearly evaluate the research potential of students; they thus favour the transition of master’s students, rather than bachelor’s students, to PhD programs. The phenomenon is relatively new in Canada, and stakeholders have only recently started to examine and consider this practice.

In sum, the academic community is very interested in learning more about providing indirect or direct entry options to students, and many have begun evaluating such practices (if they have not already been implemented); they would like to have the opportunity to discuss this issue at institutional and international levels.

Table IV Master's enrolment, in percentage, and by registration status, 1994–2003

Year	Full-time student		Part-time student		Total
	Nb	%	Nb	%	Nb
1994	41,700	59.8%	28,083	40.2%	69,783
1995	41,224	59.5%	28,076	40.5%	69,300
1996	41,585	60.2%	27,510	39.8%	69,095
1997	42,191	60.4%	27,661	39.6%	69,852
1998	44,794	62.8%	26,499	37.2%	71,293
1999	46,887	63.1%	27,444	36.9%	74,331
2000	47,381	63.0%	27,816	37.0%	75,197
2001	50,057	62.9%	29,478	37.1%	79,535
2002	55,095	64.2%	30,704	35.8%	85,799
2003	59,700	66.8%	29,687	33.2%	89,387

Source: Compiled by Science-Metrix from data prepared by Statistics Canada (ESIS)

When asked about the most important changes in their clientele over the last five to eight years, many of the university representatives interviewed reported that several programs had become more accommodating to part-time and mature students who could continue to be members of the



workforce while completing their degree program. Conversely, some large university representatives reported that they were placing more emphasis on full-time studies.

Surprisingly, and in contrast to some stakeholders' views, recent data on part-time and full-time enrolment suggests that there has been a gradual increase in the number of full-time enrolments of students (Table IV; Drewes and O'Heron 1999); this is particularly so for the period with the highest overall growth in enrolment (1999–2003). During that period, the average annual growth of full-time enrolments was 6.6%, while the average growth of part-time enrolments was 2.6%. In fact, enrolment of part-time students fell by about 4 percentage points between 2001 and 2003. In 2003, 67% of the student population had full-time status, and 33% had part-time status.

### 3.2 Evolution of master's programs

University representatives from graduate studies offices reported in interviews that an average of 10 new master's programs had been created in their respective universities in the last five to eight years. They also reported that a null or negligible number of programs had been discontinued over the same period. Programs were discontinued for reasons such as budget cuts, retirements, low student attraction rates and the withdrawal of funding from an essential funding partner.

In 2004, the AUCC's Directory of Canadian Universities compiled information on a total of 2,699 master's programs in 75 different universities and post-secondary institutions (Table V)<sup>5</sup>.

The distribution of these programs across Canadian provinces is relatively consistent with the number of universities per province.

According to interviewees, the evolution of existing master's programs and the development of new programs have accelerated in response to perceived demand and/or needs of non-academic stakeholders. Many of the changes affecting master's programs in Canada stem from emerging requirements in the private and public sectors, as well as societal needs. The link between academic departments and the industrial and public sectors is stronger with respect to professionally-oriented master's programs. As a result, some programs have been created in direct response to specific demands from industry and government for specialized scientific and technological skills and knowledge.

Table V Institutions and master's programs, by province, 2004–2005

Province	Number of institutions	Number of Masters programs	% Canada
Alberta	4	313	11.6%
British Columbia	8	381	14.1%
Manitoba	4	99	3.7%
New Brunswick	3	75	2.8%
Newfoundland and Labrador	1	67	2.5%
Nova Scotia	9	178	6.6%
Ontario	24	882	32.7%
Prince Edward Island	1	7	0.3%
Quebec	18	553	20.5%
Saskatchewan	3	144	5.3%
<b>Canada</b>	<b>75</b>	<b>2,699</b>	<b>100.0%</b>

Source: Compiled by Science-Metrix from the AUCC Directory of Canadian Universities (DCU)

Input from industry is being actively sought by universities. For instance, the Master's in Manufacturing Management was developed by McGill University with input from over 30 companies. Internships are a major component of the program: students are required to undertake a 4 to 12 month internship at a company, interact

<sup>5</sup> Science-Metrix used the AUCC Directory of Canadian Universities (DCU) to produce statistics on the number of master's programs in Canada. This source of data was preferred to Statistics Canada's ESIS system because the latter is relatively new and currently only about 50% of Canadian universities report the number of master's programs at their institution. The resulting assessment is an estimate only because the program names in the AUCC database are not standardized and lack consistency. However, Science-Metrix harmonized data as thoroughly as possible.



with many of the departments within the company, write a report, and make a presentation on the experience. The dynamic nature of the program, and of industry, leads to constant change and course substitution in the curriculum. The program is reviewed every four years by an industry advisory board; in addition, feedback is obtained from students (who are surveyed every semester) and alumni (who are surveyed every few years). Feedback is also obtained from the companies providing the internships. Great emphasis has been placed on interaction with industry, so the program has added more case studies, more professional development, and more plant tours.

According to those interviewed, the development of new programs (or the improvement of current programs) is a bottom-up process, starting at the departmental level. It is usually the initiative of one individual or one department, and the program is subsequently revised by means of a number of internal faculty and university governance reviews and external reviews by national or international experts or, in some cases, provincial regulatory bodies.

Universities are also attempting to develop programs that are unique to their university and are not likely to be offered elsewhere. Interviewees said that compared to doctoral programs, master's programs are critical for both sustaining and raising the visibility of universities. In part, this is due to the links established between academic programs and the communities in which they exist; these programs are targeting a wider audience than ever before, such as lifelong learners from the private, public and not-for-profit sectors.

Universities seek to develop programs for people who want to change careers or provide training for people who are interested in upgrading their skills and credentials in their current lines of work. Interviewees also mentioned that students' needs and expectations shape the development of Canadian master's programs. They argue that

many students are realizing that bachelor's degrees no longer provide them with the job opportunities that once could be expected. The result has been an overall increase in enrolment and in the development of new programs, particularly professionally-oriented programs that offer specialized training.

There is also an influx of students who are returning to academia after spending years in the workplace; the increasing prevalence of these students obviates the necessity for unconventional master's programs that fit with their professional orientation and evolving needs. One illustration of this phenomenon is provided by Dalhousie University's Master of Health Informatics where the majority of students entering the program have already worked for many years—ideally applicants will have at least two years' experience working with health-related data.

As mentioned in Section 2, one of the most important trends at the global level in master's degrees is the importance of multidisciplinary aspects, and here Canada is no exception. The above mentioned Master of Health Informatics program at Dalhousie also provides a good example of the multidisciplinary nature of many new master's programs. It is a two-year 12-course program that “promotes and supports the use of health informatics in health services delivery, health management systems, research, learning and health policy development” ([www.healthinformatics.dal.ca](http://www.healthinformatics.dal.ca)). According to university representatives, this innovative, multidisciplinary program was the first of its kind in Canada. It is the result of collaboration between the Faculties of Medicine and Computer Science; members of both faculties teach courses in the program. For students who have a strong background in health sciences, the focus of their study will be on IT training, and vice-versa. In addition, students are required to take courses in management and statistics.



In some cases, multidisciplinary is not only convenient because it allows a program to have contents tailored to a specific topic-area, there is also the added benefit that it is easier for universities to create new programs using existing resources as opposed to hiring new staff and setting up additional structures. For example, in the multidisciplinary *Maîtrise en études internationales* (Master of International Studies) at Université Laval, courses are taken in the departments of law, politics and economics, among others.

Evidently, in some cases, a program goes far beyond providing the courses already offered by the university. The Master of Environment at the University of Manitoba is interdisciplinary rather than multidisciplinary because the disciplinary components are so well integrated into the program. While many other environmental programs require that students focus on one specific area, the University of Manitoba's program covers a broad spectrum of issues to achieve an all-encompassing view of environmental matters. A different theme or topic is selected every semester, depending on student groups' interests. In addition, the participation of industry in the program is very significant and an external liaison board is made up of government, provincial and city agencies and industry groups. Despite the fact that the university did have existing master's degrees related to environmental studies and science, the degree was established following a perceived need for a program that would train students in the real-world components of environmental issues. Students are trained to deal with the kinds of problems that they are likely to encounter in their professional lives. These issues tend to be complex, diverse and broad, and they are addressed by strong and coherent interdisciplinary teams—a primary focus of the program's training.

An important feature of many new programs is their flexibility. For example, in Dalhousie University's Master of Health Informatics, one-third of the program's students choose to write a

dissertation (research-oriented route), while the remaining two-thirds opt to work as interns with organizations that deal with health data (professionally-oriented route). A similar approach has been taken by the University of Victoria's Master of Arts in Indigenous Governance where students can complete a degree either by writing a thesis or through internships (<http://web.uvic.ca/igov/>).

Another illustration of this type of flexibility and the willingness to meet the needs of a varied clientele is the dual-degree program offered by the University of Toronto, the Master of Nursing/Master of Health Sciences, an integrated program of study for students who are interested in both nursing and health administration. Initially there was a dual MN/MBA degree as well, but tuition fees for that program were very high due to the MBA component. There is also a Master of Nurse Practitioner, the University of Toronto being the first university to have such a program.

As seen in Section 2, the originality of master's programs is not limited to their content, but also extends to their mode of delivery. This is exemplified by the Master of Fine Arts, Creative Writing (Optional-Residency Option) at the University of British Columbia. In this program, a degree can be obtained through on-line distance learning ([www.creativewriting.ubc.ca/programs/lowres.cfm](http://www.creativewriting.ubc.ca/programs/lowres.cfm)). The Optional-Residency Option arose from a perceived need for the innovative delivery of the creative writing program, which has existed successfully for many years at the University of British Columbia. The program comprises online workshops, which are mentored by a faculty member and to which students bring their own work and subsequently receive feedback. Intensive residential training on campus in the summer provides students with an opportunity to meet faculty and other students and is a complement to the work performed online. This type of program is in fact a modern interpretation of those that were traditionally offered by open universities, with the difference that it uses up-to-date communication technologies.



The Master of Applied Health Services Research offered in the Atlantic region is one program that exemplifies nearly all current trends affecting the development of master's programs, integrating interdisciplinarity, e-learning and professionally-oriented and inter-institutional initiatives. This program is intended "to prepare graduates from diverse disciplines and backgrounds with the necessary skills to tackle the complex health policy issues facing us today and in the future. The overall aim of the program is to promote and support health services scholarship and research capacity" (School of Health Services Administration, Dalhousie University).

The program is delivered mostly online by faculty members from a consortium of four universities: Dalhousie University, Memorial University of Newfoundland, the University of New Brunswick, and the University of Prince Edward Island. This program is coordinated by the Atlantic Regional Training Centre (ARTC - [www.artc-hsr.ca](http://www.artc-hsr.ca)), created jointly by a university partnership venture. This joint initiative is a good example of inter-university master's programs—each university would have been too small to create its own program. Through ARTC, the research and training expertise found in the region is coordinated to support master's education in a variety of disciplines ranging from traditional health science to social science and humanities disciplines.

During the third semester, usually in the summer, students spend approximately four months undertaking a research residency at a decision-making organization. This experience is expected to assist students in understanding how research is used in decision making; provide them with an opportunity to apply theory in a practical setting; and allow them to explore the merits of whether projects undertaken could be more fully developed as potential thesis research areas. The program guarantees funding to full-time students by offering a grant that covers tuition fees and the costs of attending the mandatory workshops. In

addition, students can expect to receive a monthly stipend from the collaborating organization where they have their research residency.

### 3.3 Disciplinary dimensions

According to interviewees, mature students with diverse needs—for example, those with family obligations or those who are career professionals—are increasingly returning to graduate education. There is also a population of engaged lifelong learners—mature students who seek degrees in cultural, historical or religious fields for personal gratification rather than for professional advantage. Finally, there was a definite growing interest, according to those interviewed, in new professionally-oriented, multidisciplinary master's programs.

Figure 3, in which master's programs are aggregated according to liberal arts and sciences degrees and professional degrees, shows that during the period of 1994 to 2003 a growing majority of master's students (nearly 70%) were undertaking professional-oriented degrees.

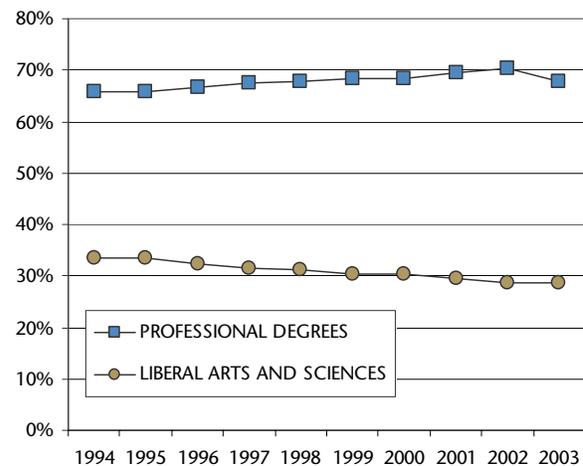


Figure 3 Master's enrolment, in percentage, and by disciplinary field, 1994–2003

Source: Compiled by Science-Metrix from data prepared by Statistics Canada (ESIS)

The increase in the number of professional degrees being offered in emerging and interdisciplinary master's programs across Canada is one of the most notable changes to occur in



graduate education in the past two decades. In the last five to ten years, terminal, professionally-oriented, and course-based or shorter-length master's degree programs have flourished within the Canadian higher education system.

Among professionally-oriented master's programs, the highest number of degrees conferred was in the business and management disciplines, accounting for 25% of master's-level graduates (Table VI). Education and engineering follow with 11.6% and 9.8% of master's graduates, respectively. There was a long-term downward trend in the proportion of students enrolled in education programs from 17.5% in 1994 to 11.8% in 2003.

Among liberal arts and science programs, social sciences and biological and biomedical science disciplines were producing the highest number of master's graduates (6.8% and 4.7%, respectively). This distribution of degrees among disciplines is very similar, with some exceptions, to that observed in the United States (NCES 2000). In proportion to the total number of degrees in each country, more than twice as many education degrees are conferred in the US than in Canada. Canada is also producing twice the proportion of master's graduates as the US in social sciences and three times the proportion in biological and biomedical sciences.



Table VI Master's degrees awarded, by disciplinary field, and in percentage, 2001-2003

	2001-2003	%
<b>PROFESSIONAL DEGREES</b>		
Business, Management, Marketing and Related Support Services	19,931	24.8%
Education	9,286	11.6%
Engineering	7,847	9.8%
Health Professions and Related Clinical Sciences	4,494	5.6%
Public Administration and Social Service Professions	4,040	5.0%
Computer and Information Sciences and Support Services	2,123	2.6%
Architecture and Related Services	1,665	2.1%
Natural Resources and Conservation	1,623	2.0%
Legal Professions and Studies	1,260	1.6%
Library Science	1,074	1.3%
Parks, Recreation, Leisure and Fitness Studies	860	1.1%
Agriculture, Agriculture Operations and Related Sciences	789	1.0%
Communication, Journalism and Related Programs	691	0.9%
Family and Consumer Sciences/Human Sciences	491	0.6%
Dental, Medical and Veterinary Residency Programs	449	0.6%
Military Technologies	105	0.1%
Transportation and Materials Moving	15	0.02%
<b>Total</b>	<b>56,743</b>	<b>70.7%</b>
<b>LIBERAL ARTS AND SCIENCES</b>		
Social Sciences	5,468	6.8%
Biological and Biomedical Sciences	3,770	4.7%
Psychology	2,487	3.1%
Physical Sciences	2,069	2.6%
Visual and Performing Arts	1,714	2.1%
English Language and Literature/Letters	1,391	1.7%
History	1,127	1.4%
Philosophy and Religious Studies	1,064	1.3%
Mathematics and Statistics	994	1.2%
Aboriginal and Foreign Languages, Literatures and Linguistics	976	1.2%
Theology and Religious Vocations	813	1.0%
French Language and Literature/Letters	681	0.8%
Multidisciplinary/Interdisciplinary Studies	500	0.6%
Area, Ethnic, Cultural and Gender Studies	337	0.4%
Liberal Arts and Sciences, General Studies and Humanities	110	0.1%
<b>Total</b>	<b>23,501</b>	<b>29.3%</b>
<b>GRAND TOTAL</b>	<b>80,248</b>	<b>100%</b>

Source: Compiled by Science-Metrix from data prepared by Statistics Canada (ESIS)



As previously noted, part-time registrations in master's programs has been declining since 1994. This is true for all fields of study. However, education- and business-related programs, which have a strong tradition of sustaining a part-time course curriculum, have maintained their level of part-time students, at over 45% and 65% per year, respectively.

Enrolment data suggest that part-time programs in liberal arts and sciences programs are less likely to be in demand or available. For example, part-time registration decreased significantly during the last decade in programs related to physical and life sciences, and technologies (from 17.5% to 6.5%). Not surprisingly, the proportion of part-time students is much greater in professionally-oriented degrees. For example, business programs had 46.3% of part-timers, and education programs had 67.6% in 2003.

## 3.4 Gender

### 3.4.1 Enrolment

Women constitute the majority of students in almost every undergraduate program in Canada; their predominance in graduate studies is a fairly recent phenomenon at the master's level. The demographic shift towards a higher proportion of women at the master's level began in 1994 (Figure 4).

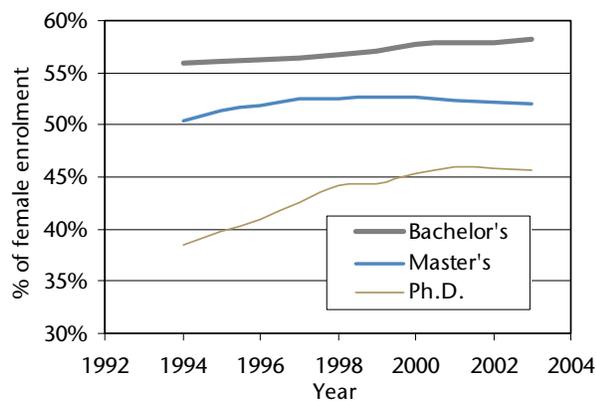


Figure 4 Female enrolment, in percentage, and by level of study, 1994–2003

Source: Compiled by Science-Metrix from data prepared by Statistics Canada (ESIS)

Since 1997, there has consistently been at least 8% more female than male students. In 2003, the Canadian master's student population was composed of approximately 46,500 women, representing 52% of the population, and 42,850 men, representing 48%. Fewer women than men were enrolled in doctoral degree programs in Canadian universities during the same period, though the gap between male and female students is narrowing (Figure 4; OST 2004).

### 3.4.2 Registration status

There are important gender divergences with respect to registration status. As seen in Figure 5, as of 1997, the majority of full-time students are female. The proportion of female students enrolled part-time (54%) is even higher than those enrolled full-time, suggesting that a greater proportion of females may be engaged in vocational and lifelong learning. This may also reflect family and financial variables, but further enquiry would be required to explain this difference.

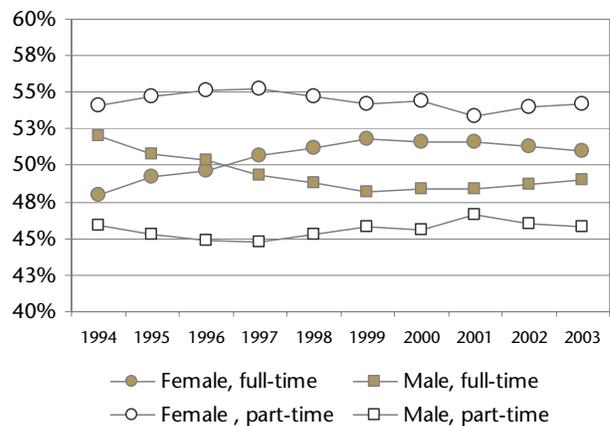


Figure 5 Master's enrolment, in percentage, by gender, and registration status, 1994–2003

Source: Compiled by Science-Metrix from data prepared by Statistics Canada (ESIS)

### 3.4.3 Graduation rates

The data on graduation rates also reveal that an increasing proportion of master's students are women, as the proportion of female graduates grew from 48.8% in 1994 to 52.1% in 2003 (Table VII).



Table VII Master's degrees awarded, in percentage, and by gender, 1994–2003

Year	Female		Male		Total
	Graduates	Share	Graduates	Share	
1994	10,391	48.8%	10,901	51.2%	<b>21,292</b>
1995	10,761	50.4%	10,595	49.6%	<b>21,356</b>
1996	10,980	50.9%	10,578	49.1%	<b>21,558</b>
1997	10,858	50.9%	10,461	49.1%	<b>21,319</b>
1998	11,512	52.3%	10,514	47.7%	<b>22,026</b>
1999	12,054	51.8%	11,218	48.2%	<b>23,272</b>
2000	12,838	53.0%	11,390	47.0%	<b>24,228</b>
2001	13,025	52.3%	11,878	47.7%	<b>24,905</b>
2002	13,836	52.6%	12,489	47.4%	<b>26,325</b>
2003	15,120	52.1%	13,898	47.9%	<b>29,018</b>

Source: Compiled by Science–Metrix from data prepared by Statistics Canada (ESIS)

#### 3.4.4 Province

The proportion of women at the master's level is higher than the Canadian average (52%) in the Atlantic Provinces (57%) and in British Columbia (56%). In Ontario and the Prairie Provinces women represent 53% and 51.5%, respectively, of the students in master's-level programs. In Quebec, the province where the percentage of male and female students tends to be the most balanced, 49.6% of the master's student population in 2003 was female (data not shown).

#### 3.4.5 Discipline

Table VIII shows that women predominate in health-related disciplines and in education, where they constitute about three-quarters of those enrolled. However, women's presence is meagre in Personal, Protective and Transportation Services, Architecture, Engineering and Related Technologies, and in Mathematics, Computer and Information Sciences.

Census data show that female master's graduates are in the majority in health occupations, art, culture, recreation and sport, and in social science, education, government service and religion (Table IX).

Table VIII Female enrolment at the master's, in percentage, and by disciplinary field, 2003

Discipline	% of female
Health, Dentistry and Veterinary Medicine	78.1%
Education	73.6%
Social and Behavioural Sciences, and Law	63.2%
Visual and Performing Arts & Communications Tech.	59.6%
Parks, Recreation and Fitness	58.5%
Agriculture, Natural Resources and Conservation	56.6%
Humanities	55.3%
Physical and Life Sciences, and Technologies	52.1%
Business, Management and Public Administration	44.3%
Mathematics, Computer and Information Sciences	38.9%
Architecture, Engineering and Related Technologies	27.3%
Personal, Protective and Transportation Services	16.7%
<b>Total</b>	<b>52.1%</b>

Source: Compiled by Science-Metrix from data prepared by Statistics Canada (ESIS)

It is interesting to note that in the “traditional” occupations such as Trades, Transport and Equipment Operators and Related Occupations and, to a lesser extent, in Occupations Related to Primary Industry as well as those related to the Natural and Applied sciences, women are largely absent.



Table IX Women with a master's degree, by occupation, and in percentage, 1996 and 2001

Occupation	Female employment	% of female
Health occupations	12,030	66.9%
Occupations in art, culture, recreation and sport	14,025	60.0%
Occupations in social science, education, government service and religion	71,590	53.9%
Business, finance and administration occupations	20,450	46.4%
Sales and service occupations	8,955	41.8%
Management occupations	23,495	33.3%
Occupations unique to processing, manufacturing and utilities	1,070	31.8%
Natural and applied sciences and related occupations	10,575	24.2%
Occupations unique to primary industry	565	22.3%
Trades, transport and equipment operators and related occupations	525	8.3%

Source: Compiled by Science-Metrix from Statistics Canada (1996 and 2001 Census)

### 3.4.6 Employment

Census data show that more female master's graduates (18.4%) are employed in part-time jobs than male (8.3%). Between 1990 and 1995, female master's graduates showed a modest increase (4.6%) in average employment income during the five-year period analysed, whereas male master's-degree graduates showed an increase of 13.2%.

## 3.5 Citizenship and immigration status

Immigration status data from 1994 to 2003 reveal that the master's student population is changing rapidly (Table X). First, it is clear that the progression in master's enrolment is due in large part to students born outside of Canada. Between 1997 and 2003, the number of international students and the number of Canadian permanent residents enrolled in Canadian master's programs increased by 97%, whereas the number of Canadian citizens increased by only 14%. In terms of annual average growth calculated between 1997 and 2003, the number of international students grew by 12.4%, the number of permanent residents by 13% and that of Canadian citizens increased by only 2.2%.

In 2003, the average proportion of international students enrolled in master's programs was 12.9%. Programs where the proportion of international students are above the national average include Mathematics, Computer and Information Sciences (18.9%), Architecture, Engineering and Related Technologies (18%), Business, Management and Public Administration (15.3%), and Physical and Life Sciences, and Technologies (14.2%).

International students in Humanities, Visual and Performing Arts, Health, and Education programs are below the national level (10.7%, 10.3%, 6.7% and 4.1%, respectively).

When looking at the proportion of women enrolled in master's programs in the last 10 years by immigration status, international female students consistently represented around 40% of the population, whereas the Canadian student population comprised about 53% of women on average (Figure 6).

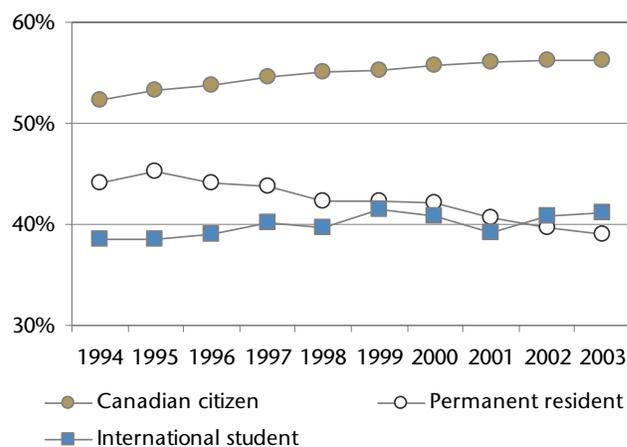


Figure 6 Female enrolment at the master's, in percentage, and by immigration status, 1994–2003

Source: Compiled by Science-Metrix from data prepared by Statistics Canada (ESIS)

Also noteworthy, starting in 1995, there has been a steady decline of women in the Canadian permanent resident student population, from 44% in 1994 to 39% in 2003. Conversely, the proportion of women enrolled as Canadian citizens has increased from 52% to 56% over the period.



Table X Master's enrolment, by immigration status, 1997-2003

Immigration status	1997	1998	1999	2000	2001	2002	2003	Growth
Canadian citizen	57,972	58,473	59,895	59,223	60,609	64,248	65,991	2.1%
Permanent resident*	6,030	6,477	7,347	7,932	9,477	11,355	11,886	13.0%
International student	5,850	6,339	7,080	8,040	9,444	10,191	11,514	12.4%
<b>Total</b>	<b>69,852</b>	<b>71,293</b>	<b>74,331</b>	<b>75,197</b>	<b>79,535</b>	<b>85,799</b>	<b>89,387</b>	<b>4.3%</b>

Source: Compiled by Science-Metrix from data prepared by Statistics Canada (ESIS)

\*including Inuit, North American Indian and Metis; \*\*formerly called landed immigrant

### 3.6 Age

The average age of master's students has been relatively stable over the last decade. It fell slightly from 31.4 in 1994 to 31.1 in 2003 (Figure 7). The relative distribution of the master's student population by age group has remained fairly constant over the same period. Age groups for the ten-year period were distributed as follows: 19.6% of the student population was 22–24 years old; 32.6% was 25–29 years old; 17.7% was 30–34 years old; 11.3% was 35–39 years old; 8.1% were 40–44 years old; 5.8% were 45–49 years old; 2.5% were 50–54 years old; and 2.0% were 55 years old and over.

These data contrast with the perceptions of university representatives who were interviewed in this study. The interviewees perceived changes

in the master's student clientele towards a more mature student profile.

An analysis of age groups suggests that the average age of students enrolled in master's programs also has not increased in general. However, analysis of enrolment in each age group reveals that, as a group, the number of students aged 50 years or over has increased faster than those in other age groups. In fact, enrolments of 50–54 year olds and 55–59 year olds showed higher average annual growth (5.1% and 7.6%, respectively) than in all age groups (2.9%) for the entire period studied. These age groups represent only a small proportion of the population, and, as we have seen, these changes do not affect the mean age. The growth of these older age groups, though, is somewhat in line with impressions of the university representatives regarding the aging of the master's student population.



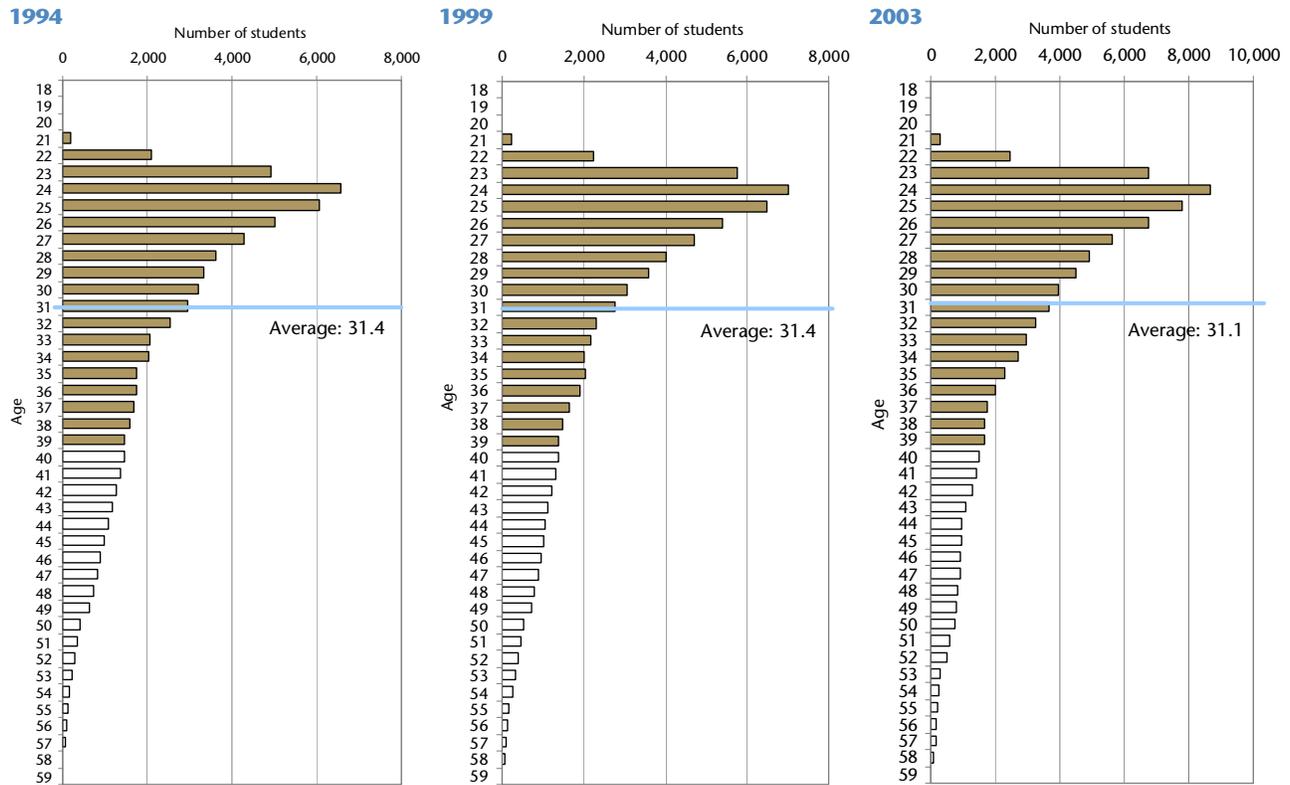


Figure 7 Age distribution of master's students, 1994, 1999 and 2003

Source: Compiled by Science-Metrix from data prepared by Statistics Canada (ESIS)

### 3.7 Student Funding

According to interviewees, limited funding for master's students discourages enrolment and affects time to completion and success rates. In fact, a large proportion of master's students, particularly those in professional or course-based programs, do not have access to research scholarships, so they must work part-time or even full-time; this inevitably affects the time they can devote to their training activities, lengthening their time to completion. In addition, professors are discouraged from supervising a master's student in cases where adequate funding is not available to the student.

Some interviewees claim that universities may be less concerned with funding for master's students than for doctoral students. Responsibility for this is generally left in the hands of individual departments, which have their own policies and *modus operandi*. However, changes such as the

size of awards and mechanisms for financial support are affecting master's student funding; as a result, universities are making efforts to find more funding or alternative solutions. Offering more teaching and research assistance jobs might be one such solution. Indeed, many deans and program managers interviewed for this report have observed that students who are engaged in on-campus work are more motivated and feel more connected to their research training activities.

Canadian post-secondary education has faced operating budget cuts due to falling government support in the early- to mid-1990s. At the turn of the millennium, reinvestment initiatives stemming from the Canadian Innovation Strategy greatly improved graduate student support. For example, funding from centres of excellence, research chairs and other targeted initiatives provide support to graduate students through research assistantships.



Having the most direct impact on the graduate funding landscape is the Canada Graduate Scholarship (CGS) program, launched in 2004. This program, which is delivered through the three national funding councils, specifically aims to provide additional, or in some cases sole, support for master's students. The CGS funding scheme was new and particularly important to students in social sciences and humanities disciplines because funding levels in these disciplines are generally lower than in natural sciences and engineering and health-related science; and no specific funding was available for master's students from the Social Sciences and Humanities Research Council (SSHRC) funding programs. SSHRC CGS Master's Scholarships programs funded 811 students in 2003–2004 to a total amount of \$14,210,500 (an average of \$17,522 per student) and, in 2004–2005, \$16,977,188 were allocated to 974 students (\$17,430 per student).

The Natural Sciences and Engineering Research Council (NSERC) also improved the merit-based funding opportunities for students in these disciplines with CGS Fellowships and Postgraduate Scholarships for master's students. In 2004–2005, these programs together funded 1,175 students to a total of \$20,231,920 (\$17,219 per student).

The Canadian Institutes of Health Research (CIHR) also distributes the CGS master's scholarships. From 2003–2004 to 2005–2006, CIHR allocated \$2,452,800 in awards to 183 students (\$13,403 per student). CIHR's CGS master's scholarships are likely to be offered in greater numbers in the future. CIHR's institutes also offered 10 specific or thematic master's awards, such as the Institute of Aging, Gender and Health, Infection and Immunity, and HIV/AIDS CBR Program Master's Awards.

In 2004–2005, the three research councils (SSHRC, NSERC, and CIHR) together supported 1,390 master's students, representing about 2% of the total Canadian master's student population.

In addition to scholarships, NSERC and CIHR offer summer research assistantships to master's students; this does not apply to students in SSHRC-related disciplines. However, as social sciences research is driven towards more collaborative research and becomes more established in research teams and research centres, this summer funding for students may be offered to social science and humanities students.

CGS scholarships are particularly welcome where provincial education systems do not provide funding support for graduate students. Provincial systems are in place only in Alberta, Ontario and Quebec. Quebec's funding councils have a similar structure as the federal granting councils and are divided into three main groups of disciplines: the *Fonds québécois de la recherche sur la nature et les technologies* (which allocated \$2,243,262 to 231 master's students in 2004–2005); the *Fonds québécois de la recherche sur la société et la culture* (which allocated \$3,323,489 to 331 master's students in 2004–2005); and the *Fonds de recherche en santé du Québec* (which funded 528 master's, doctorate, post-doctorate and professional students to a total amount of \$10,255,339 in 2004–2005).

In Alberta, the government offers master's scholarships through the Alberta Scholarship Programs. In addition, the Alberta Heritage Foundation for Medical Research (AHFMR) is a major not-for-profit source of master's student funding in the province. Based on the AHFMR's model and attempting to repeat this successful structure, the Government of Alberta created the Alberta Ingenuity Fund (Alberta Heritage Foundation for Science and Engineering Research) in 2000 to support graduate student researchers in the natural sciences and engineering disciplines.

The Ontario Graduate Scholarship Program, administered by the Ontario government, also provides support to master's students. In other provinces such as British Columbia, Manitoba, Nova Scotia, and Newfoundland and Labrador, research foundations and private funds dedicated



to backing mainly health-related research, offer support to master's students, but no broader provincial funding systems are in place to fund research in NSE and SSH disciplines.

Outside government and external merit-based awards, master's students usually procure student loans offered under provincial financial assistantship programs. Some students work as university teachers or as research assistants, and some work outside the academic environment. It is important to note that students enrolled in professionally-oriented, course-based or non-thesis programs usually do not have access to internal or external merit-based awards, which are mainly reserved for students in research programs.

However, in Canada, other external funding opportunities for graduate students are made available from a diversity of organizations in all institutional sectors (i.e., not-for-profit, private firms and industry). Extensive searches using Internet web sites and publicly available information were performed to document funding opportunities for master's students. Only scholarships that clearly aim at graduate or master's programs are included. However, some scholarship programs may be accessible to undergraduates. In Canada, more than 60 different scholarships are available to master's students in different disciplines. This external funding is mostly merit-based, potentially accommodates more than 500 students and represents more than 3 million dollars.

Universities support graduate students directly through internal funds or departmental research grants. Internal tuition awards are common, and international students are also eligible for tuition scholarships. Data on the level of internal support to graduate students and to master's students in particular are not readily available. However, it is interesting to look at overall student support expenditure in Canadian universities. Support for students increased by more than 41% between 1994 and 2001. This level is similar to student enrolment, which increased over the same period.

Many of those interviewed for this study have observed a trend among large research-based universities of increasingly offering guaranteed funding for graduate students. This may impact on their capacity to attract students or, more globally, the competitiveness of smaller institutions or universities particularly those located in regions where no provincial scholarships are offered.

In the larger universities, and especially for programs that are more closely tailored to the needs of industry, it is often easier to obtain adequate levels of financing. For example, in McGill University's Master in Manufacturing Management program, funding is a strategic issue because tuition costs for the program are relatively high (\$25,000). Students can take advantage of three kinds of funding: entrance scholarships (\$5,000); 3M scholarships (\$12,500); and a Werner Graupe fellowship (\$20,000). All of these fellowships/scholarships have a minimum standard that must be met (as evaluated by CGPA and GMAT). There is also a loan program run by the Royal Bank of Canada in which McGill pays the interest while the student is attending the program. Internships are paid by the participating company.

According to many of the program managers interviewed, funding, or the lack thereof, determines whether students' enrol in graduate education and, conversely, it can influence the continuation of programs offered by some universities. For instance, in the case of Dalhousie University's Master of Health Informatics, funding has been identified as an issue affecting adequate participation in the program. Presently, there are small entrance fellowships available for students, and the program tries to ensure that fellowships are available for second-year students as well. Provincial scholarships may be available, the Faculty of Graduate Studies offers scholarships and fellowships, and Dalhousie University has several bursaries available to students; external funding sources from the Canadian Institutes of Health Research are also available.



The Canadian funding landscape for graduate education is not consolidated and integrated into a common national strategy. As a higher number of master's students procure merit-based scholarships, support for a greater proportion of students will be the major challenge because of projected increases in enrolment (AUCC 2002). This is particularly true in non-research programs, where funding is less available at the moment. Thus, another and increasing challenge for universities is to provide sufficient infrastructure for funding and the supervision of resources.

### 3.8 Cost and benefit analysis of master's degree education

Based on Statistics Canada data, the financial costs and benefits of master's degree education for graduates can be analyzed by comparing the same costs and benefits of the other university degree levels (bachelor and doctoral). We did not perform a formal economic analysis, although this would be helpful given the current lack of detailed information on the subject; we simply provide a qualitative assessment here.

Graduates' profiles and economic characteristics can be compared through a number of variables based on data made available by the National Graduate Survey. These variables are percentage of students who borrowed money to complete their education; average debt at graduation; percentage of debt repaid two years after graduation; and average income of graduates.

Graduates with master's and doctoral degrees borrowed money to finance their studies less often than undergraduate students (Table XI). This is likely due to greater availability of merit-based financing, but also to better-paid jobs and to teaching and research assistantship positions. This may also be a reflection of what Pierre Bourdieu, the acclaimed French sociologist whose work often focused on education and culture, calls the reproduction of social classes and the fact that graduate students tend to come from wealthier families. The debt characteristics of master's

graduates are similar to those of bachelor-level graduates. The average debt of a bachelor student is \$20,500, while it is \$20,300 for a master's student. Full-time employment opportunities for all groups are about the same for both levels of study, although it is slightly higher for master's graduates.

The path to the master's degree for bachelor's degree holders is certainly not always a direct one. The median age at time of graduation reveals that a period of six years separates bachelor-level and master's graduates. This means that master's studies are not always one step along a continuous education trajectory. Studying at the master's level may be the result of changing career plans or be influenced by students' occupations and other obligations. For example, further examination of the demographics of those graduates who owed money from government loans at graduation revealed that 5% more of the master's than bachelor-level graduates had dependent children and 13% more were married. This suggests that master's students may have greater financial obligations, leading them to enrol part-time.

Overall, the master's degree has cost-benefit advantages over the other two higher education degrees. When the three degrees are compared, the difference in salaries earned at the master's level is noticeably higher than at the bachelor level and only somewhat lower than at the doctoral level. When the average of estimated gross annual earnings of year 2000 graduates working full-time two year after graduation (in 2002) are compared, master's graduates earned 25% more than bachelor's degree graduates, while doctoral graduates earned 37% more than master's graduates.

However, census data of the active population show that the gap between doctoral graduates and master's graduates narrows significantly in the years following graduation since the difference in average salary of the working population is only 7% between master's and PhD graduates.



The cost/benefit advantage of master's degrees over bachelor's or doctoral degrees varies significantly across fields of study. A comparative analysis of the earnings of higher education degree holders from 2001 Census of Canada data shows that the greatest benefits of having completed master's studies versus bachelor-level studies in

terms of increasing income levels were in commerce, management and administration as well as in the health professions. The advantage was marginal in engineering and applied sciences, mathematics and physical sciences, humanities and related fields, and to a lesser extent, in fine and applied arts (Table XII; Jedwab 2004).

Table XI Economic and demographic profile of university graduates, by level of study

<b>Variable</b>	<b>Bachelor</b>	<b>Master</b>	<b>Doctorate</b>
Percentage of graduates who borrowed (%)	53	45	45
Average debt of those who borrowed at graduation in 2000 (\$)	20,500	20,300	23,900
Percentage of debt repaid 2 years after graduation (%)	23	27	28
Employed full-time (%)	81	84	82
Average duration of program if taken full time (months)	40	26	62
Median age at time of graduation (years)	23	29	33
Average income of graduates with debt in 2001 (\$) (2 years after graduation)	33,400	41,900	57,600
Average income of workforce in 2001 (\$)	58,148	72,335	77,399

Source: Compiled by Science-Metrix from various Statistics Canada data

Conversely, there was a fairly important financial benefit to having pursued doctoral studies in fine and applied arts, agricultural, biological and food-related sciences, humanities and the health professions. On average, there were negative returns in applied science, technologies and trades. The relative benefit of doctoral studies in the fields of engineering and commerce and administration was moderate (10% or less).

Overall, the master's degree represents a good investment for new graduates, returning students and workers seeking further professional

development. This becomes clear when the ratio of income to the average program duration of master's graduates is compared to that of doctorates. The data revealed that, on average, it takes an additional 62 months to complete a PhD for an increase in income of only 7%. Consequently, in many fields, the PhD should not be seen as a means to maximize the financial return on educational investment; rather, it should be seen as a way to achieve professional, academic, scientific success. ■



Table XII Average employment income of university graduates, by disciplinary field, and level of study, 2000

<b>Major Field of Study</b>	<b>Bachelor</b>	<b>Master</b>	<b>Δ over Bachelor</b>	<b>Doctorate</b>	<b>Δ over Master</b>
Commerce, management and business administration	\$65,157	<b>\$102,952</b>	58%	\$113,730	10%
Engineering and applied sciences	\$71,526	<b>\$75,673</b>	6%	\$82,515	9%
Health professions, sciences and technologies	\$52,219	<b>\$75,183</b>	44%	\$93,608	25%
Mathematics and physical sciences	\$65,221	<b>\$68,500</b>	5%	\$77,517	13%
Social sciences and related fields	\$60,205	<b>\$68,116</b>	13%	\$77,866	14%
Applied science technologies and trades	\$50,610	<b>\$59,142</b>	17%	\$56,592	-4%
Educational, recreational and counselling services	\$45,747	<b>\$58,660</b>	28%	\$68,120	16%
Agricultural, biological, nutritional, and food sciences	\$46,977	<b>\$51,500</b>	10%	\$68,024	32%
Humanities and related fields	\$48,944	<b>\$50,907</b>	4%	\$63,651	25%
Fine and applied arts	\$40,981	<b>\$44,180</b>	8%	\$61,622	39%
<b>Average</b>	<b>\$58,148</b>	<b>\$72,335</b>	<b>24%</b>	<b>\$77,399</b>	<b>7%</b>

Source: Compiled by Science-Metrix from Statistics Canada data (2001 Census)



## 4 Discussion and conclusion

Canadian university representatives are optimistic about the current and future state of Canadian master's programs. According to them, the master's degree is strong in Canada, and Canadian universities have, and will continue to have, a strong tradition of research-based master's training. At the same time, professional master's degrees are playing an increasingly important role in the Canadian workplace in a context of increased expectations and demands from employers.

There is increased public awareness of the diversity and sophistication of graduate education generally, and master's education is well-positioned to answer increased levels of demand. On a global scale, the university representatives interviewed believe that Canada is keeping up with international trends in master's program developments, and some are even of the opinion that Canada is a leader in the development of these programs.

Probably the most important trends affecting the evolution of master's degrees in Canada and abroad are growth in professional degrees and enrolment. Other phenomena that may not have such a profound effect on master's education include multidisciplinary, joint- and dual-degrees, and e-learning and distance learning programs.

One of the most significant of these trends involves the tailoring of programs to the needs of the workplace. While professional degree programs have been in place for some years, governments are increasingly coming more in line with industry in arguing that scientific research should no longer be disinterested but rather fully engaged in tackling social and economic problems (OECD 2004). Although this paradigm has met with resistance by those in higher education who want to maintain the intellectual independence of universities, the resulting discourse has had a

global impact on university culture and has shaped the evolution of higher education programs. For instance, it is not uncommon to see universities developing flexible curricula to meet perceived demands relating to the training of personnel, and it is also not uncommon to see professional and industrial associations commission universities to tailor course requirements to their needs.

Programs identified as innovative by university representatives are primarily designed to answer the perceived needs of the community and professional organizations. Paradoxically, they offer specialized training that is likely to produce graduates with new expertise and skills that may not yet be recognized by employers. Consequently, the integration of these specialized graduates in the workplace is not guaranteed.

For many university representatives, the master's level is becoming the minimum required level of training in a number of professional domains. While the value of master's education in the workplace varies across fields, there is a growing emphasis on the necessity of completing a graduate degree among those who enter high-level jobs in the workplace. The demand for master's education is equally strong from those who have recently completed undergraduate studies and those returning to academia from the workplace. These students recognize the added value of a master's education for both professional development and employment opportunities. In fact, when examining the average salary earned by graduates from Canadian and US universities, the return on investment for completing a master's degree is clear; in general, master's degree holders entering the workplace have a substantial advantage over those who only hold a bachelor's degree.

An important cultural change that stems at least in part from the contemporary discourse of governments and international organizations such as the European Commission, the OECD, and UNESCO, is the increasing importance given to



lifelong learning and continuing education, which has both stemmed from and led to greater demands for university degrees tailored to the needs of working professionals (EC 2001; OECD 2005; UNESCO 2005). In response, universities are offering part-time courses and a mix of in-class and distance-learning courses to accommodate the busy schedules of professionals. These practices are fairly new at the master's level with the exception of certain professionally-oriented programs, such as the Master in Business Administration, which pioneered the delivery of courses to a busy and mature clientele.

These changes have put pressure on universities to place more emphasis on creating professional degrees that contrast with the more conventional research-oriented programs. This has led to the creation of more non-thesis programs where courses and internships play a central role. Indeed, professional programs that cover a wide range of disciplines and specialized applications are flourishing in Canada and around the world.

Another very important trend affecting Canadian master's-level education is the internationalization of higher education. This entails not only an influx of foreign students, but also the integration of an international/intercultural dimension into teaching, research and community service. Also, higher education institutions are collaborating in developing new training programs that facilitate the acquisition of cross-border knowledge and skills such as the MBA program at Dalhousie University. Various Canadian collaborative and academic exchange initiatives have developed master's programs overseas (AUCC 2000; 2004). However, Canadian universities do not clearly place emphasis on the development of their programs abroad (Knight 2004; interviews). Even if the higher education system in Canada is not as market-driven as it is in other parts of the world, quality assurance and recognition of qualifications from foreign programs and degrees are increasingly becoming a concern for Canadian institutions (Knight 2004; IAU, AUCC, ACE, CHEA 2005).

In fact, international mobility has become a mounting concern, particularly due to the establishment of the European Higher Education Area—the objective of the Bologna Process—and the University Mobility in Asia and the Pacific (UMAP) association. The growth of the areas represented by these initiatives could play a role in attracting Canadian students to them, but may also deter foreign students from enrolling in Canadian programs. According to the AUCC (2000), Canadian institutions must act rapidly if they want to attract foreign students by, for example, ensuring that qualifications gained in Canada are internationally recognized. The Canadian higher education system must also demonstrate that it can compete with these new educationally “frontierless” regions. The federal government has announced changes to Canadian immigration policies in an attempt to help universities attract more foreign students (20,000 being the current target). Students from abroad will be allowed to work part-time on their student visas (Birchard 2005), and apply for off-campus work permits; in addition applications for visas will be streamlined (Paskey 2003). However, universities are generally not making the recruitment of foreign students a high priority, nor are they doing much to respond to the opportunities created by greater mobility of students. These concerns are more likely to be addressed at the individual program level and, in fact, many degree programs have been specifically designed for international students, while others encourage the mobility of students during the course of their master's study.

Another change in the graduate education landscape, stemming in large part from programs and policies put in place by several funding councils, is the increased value placed on multidisciplinary and interdisciplinary research; this kind of approach is now believed to be the most successful way to approach the complex questions facing research teams (Brochu and Williams 2001) and the issues tackled by professionals in the workplace. Advances in



science and technology can in part be considered to stem from the restructuring and amalgamation of aspects of existing knowledge. Since traditional and delineated disciplines may not adequately allow for the kind of “repackaging” of knowledge that frequently leads to innovation, many of the new master’s degree programs are, by design, interdisciplinary or multidisciplinary in nature. These programs often combine natural science disciplines with engineering or health science disciplines with social sciences and humanities disciplines.

While some interdisciplinary or multidisciplinary programs differ from their traditional counterparts in content only, many, due to their dynamic nature, are also likely to have different modes of delivery such as the problem-based courses of the Master of Environment at the University of Manitoba, the multi-faculty course of the Master of Arts in Indigenous Governance at the University of Victoria, and industrial seminars and internships of the Master in Manufacturing Management at McGill University. They may also be more technology-oriented or more focused on problem solving. Also, professionally-oriented degrees increasingly combine science, engineering and business management knowledge and skills. Collaborative programs such as in the Master of Applied Health Services Research offered by four universities from the Atlantic region established by multiple institutions are able to provide both the resources and capacity to address the full range of issues such a program requires but would have been beyond the scope of each of the individual institutions. Moreover, students in this type of program are able to benefit from the combined skills and diverse knowledge of the various faculty members involved. In fact, many recently initiated interdisciplinary master’s degree programs are managed by well-organized teams of researchers from different faculties within the same institution or across universities that focus on a particular research topic requiring the contribution of a number of disciplines.

Some of the programs created recently in Canada involve the collaboration of at least two departments (and, in one case, a number of universities). As a result of the multi- or interdisciplinary character of many of these programs, and the fact that they represent unique or newly-emerging fields, students from dissimilar backgrounds are being more readily accepted into programs, and a diverse, often international student clientele is being sought.

More choices are being offered to students than ever before, and this is especially true with regard to the decision of whether or not to do a thesis. Traditionally, there were thesis-based (research-oriented) or non-thesis (professionally-oriented) programs. Section 3 showed that some Canadian universities now offer students within one program the choice to either write a thesis or do an internship.

More programs are incorporating distance learning in their curriculum—some only one class at a time, others an entire program. These kinds of programs are primarily targeted at a more mature clientele comprised of professionals and/or those with family obligations. In fact, most of the program directors interviewed expressed the belief that lifelong learning is an important element of their program.

There seems to be a trend in some master’s programs to be concerned about enrolling well-rounded students who have been exposed to both research training and professional development. In addition, many of the programs now have a greater focus on problem-solving, allowing students to deal with real-life issues and case studies.

Though dual-degree master’s programs were identified in the research as being an increasingly popular option for students and program directors, very few of the program managers interviewed felt that a second master’s degree would offer many additional benefits to the degree holder on the labour market, but that a better option would be to obtain a PhD.



Another factor that may contribute to the evolution of master's degrees is the increasing focus on performance management in the scientific system. The diffusion of the concepts presented in the *New Production of Knowledge* (Gibbons et al. 1994) in the academic and political spheres has led to the increased benchmarking of university performance and an allocation of resources that is consistent with the evaluation results obtained. As a result, universities are feeling pressure to strategically invest in the most promising scientists. Master's-level education has been affected because gifted students who may eventually positively influence the standing of a university or research group may be offered personalized alternatives. Interviewees told us repeatedly that master's students are participating more and more in activities that were typically reserved for doctoral candidates. In addition to contributions to research colloquia, conferences and poster presentations, master's students are increasingly interested in making and, being solicited to make, contributions to original research publications. Thus, the expectations of students and research supervisors are likely to increase over time.

In response to growing demand, Canadian universities have implemented a number of initiatives aimed to enhance the research productivity of master's graduates. Established faculties have created new master's programs to expand the research-based core curricula and to answer perceived needs from the public and private sectors. Indeed, the formats of a great number of emerging master's programs are derived from existing research-intensive programs. As a result, the training capacity of universities has increased significantly.

While the increased involvement of students in research activities has had a beneficial impact on the research capacity of universities, it sometimes adversely affects master's students' time to completion, which is a mounting issue in universities. Time to completion is also an important concern at the international level; the

duration of master's degree programs was a hotly debated topic during the implementation of the Bologna Process.

It is clear that stakeholders in master's-level education are concerned with ensuring both the effectiveness of programs and students' paths to graduation. A formal reporting protocol has been established in universities to follow the progress of master's students in order to anticipate and remove obstacles to program progression. Shortening the length of programs has been identified as one way to solve this problem (CAGS 2003). On the other hand, maintaining the quality of master's education is one of the major issues in the time to completion debate. Another solution that has been proposed is increasing support for graduate students (AUCC 2002b); this would presumably have an impact on enrolment and completion rates, but it could also, as argued by CAGS (2001), increase the retention of graduates in Canada.

Most program managers and representatives perceived student funding as a very important issue at the master's level. This was particularly true for terminal or professionally-oriented programs that are not centred on research and that have a decreased availability of scholarships. Student participation was often limited because of this, especially for international students, who are subject to higher tuition fees. Many programs would like to recruit more international students but have limited financial means and are unable to provide funding for them. Funding for the programs themselves is another ongoing challenge. It was noted how additional funding was needed in order to offer interdisciplinary or multidisciplinary training by professors from different faculties. This practice has ceased at some universities because of budget cuts. Thus, it seems that some innovative practices require a certain level of additional funding in order to be maintained. Funding support is thus a determinant of the evolution of master's degrees in Canada, both at student and program levels.



New federal initiatives that specifically target master's students are creating expectations for the improvement of master's student funding. However, it is too early to evaluate the impact of initiatives such as the Canada Graduate Scholarships on student experiences and the development of master's programs. Merit-based funding is mainly allocated to research-oriented master's students, particularly in the social sciences and humanities. Conversely, students in non-research or professionally-oriented master's programs, though they are growing in number, have not received much attention from funding agencies. These students must rely on source-specific funding from relevant organizations or internal scholarships provided by university departments and graduate offices. Overall, more than 45% of students who graduated in 2000 have borrowed money from governmental and non-governmental sources. Though it is too early to evaluate the impact of new federal funding initiatives, funding will remain a critical issue for master's students and program administrators.

#### 4.1 The challenges that lie ahead

It is clear that master's education in Canada has undergone a period of significant growth in both enrolment and number of programs; at the same time, it has had to cope with a tight budgetary environment. Following this period of rapid development, Canadian master's education is now facing numerous challenges.

Funding issues, in relation to both programs and students, are prevalent and still constitute a challenge for Canadian universities. As a result of widespread budget cuts in recent years, institutions are finding it difficult to continue meeting the demands of students and personnel. For example, universities need to provide support for new master's programs without neglecting existing ones and provide sufficient and equitable funding support for students. Additionally, despite a high completion rate at the master's level, reducing time to completion has been identified as

being important. The major challenge associated with this issue relates to preserving high-quality education.

University representatives expressed that it was very important to determine the value and purpose of master's programs and what form of programs would attract the most support from employers. It was also felt that Canadian institutions should work together to promote the recognition of Canadian master's education. This recognition and national and international visibility is vital for master's programs, as master's students practise in various professions and may establish mentoring relationships with the next generation of students, or even enter into positions of authority in Canadian and international business and industry.

The recognition of professionally-oriented or non-thesis master's programs is another challenge facing master's education in Canada. While thesis master's students are evaluated by a peer-review process, non-thesis students are usually not evaluated by external entities. This lack of external quality control and peer validation lowers credibility and could be corrected through assessment of a significant output, such as a major research report involving at least one external evaluator. This is becoming more important because the mandatory minimum level of training in professional associations and groups appears to be gradually shifting towards more specialized and advanced trained resources. These trends should be construed as an incentive to develop more stringent certification processes. ■



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## Appendix

### Canadian university representatives interviewed

- **University of Alberta**  
Faculty of Graduate Studies  
Ms. Heather M. Hogg, *Assistant Dean*
- **University of British Columbia**  
Policy and New Programs  
Dr. Jim Thompson, *Associate Dean for Policy and New Programs*  
Master of Fine Arts, Creative Writing  
Mr. Andrew Gray, *Low-Residency MFA Coordinator*
- **Dalhousie University**  
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Ms. Wendy Fletcher, *Program Officer*  
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Dr. Mike Shepherd, *Director of Health Informatics*
- **Université Laval**  
Faculté des études supérieures  
M. Marc Pelchat, *Doyen*
- **University of Manitoba**  
Faculty of Graduate Studies  
Dr. John (Jay) Doering, *Dean*  
Ms. Simone Hernandez-Ramdwar, *Admissions and Program Officer*  
Master of Environment  
Dr. Richard Baydack, *Associate Dean, Faculty of Environment*
- **McGill University**  
Graduate and Postdoctoral Studies  
Dr. James Nemes, *Associate Dean*  
Master in Manufacturing Management  
Dr. Vince Thomson, *MMM Program Co-Director*
- **Memorial University of Newfoundland**  
School of Graduate Studies  
Dr. Chet Jablonski, *Dean*
- **University of New Brunswick**  
School of Graduate Studies  
Dr. Gwendolyn Davies, *Dean and Associate vice president of research*
- **Université du Québec à Montréal**  
Bureau de l'enseignement et des programmes  
M. André Bourret, *Directeur*
- **Université de Sherbrooke**  
Vice-rectorat à la recherche  
M. Denis Marceau, *Vice-recteur aux études supérieures*  
Maîtrise en fiscalité  
M. Jean-Claude Lefebvre, *Directeur de programme*
- **Simon Fraser University**  
Graduate Studies  
Dr. Jonathan C. Driver, *Dean*
- **University of Toronto**  
School of Graduate Studies  
Dr. Susan Pfeiffer, *Dean*  
Master of Nursing (MN)  
Dr. Elizabeth Peter, *Professor*
- **University of Victoria**  
Faculty of Graduate Studies  
Dr. Aaron Devor, *Dean*  
Master of Arts in Indigenous Governance  
Ms. Susanne Thiessen, *Program manager*
- **York University**  
Faculty of Graduate Studies  
Dr. Ronald E. Pearlman, *Dean*  
Dr. John Lennox, *Former Dean*





Canadian Association for Graduate Studies