Challenges to Innovation in Graduate Education

Synopsis of the International Conference of the Canadian Association for Graduate Studies; November 2-5, 2005; Toronto, Canada
conference schedule

Keynote Address
Exploring the Unity of Knowledge
Edward O. Wilson, University Research Professor Emeritus and Honorary Curator in Entomology, Harvard University, United States of America

International Mobility
International Mobility, European Trends and Perspectives
Rons de Wit, Senior Advisor International, Universiteit van Amsterdam, The Netherlands

International Student Mobility Towards Non-OECD Countries
Karime Trimbisky, Administrator, Indicators and Analysis Division, Directorate for Education, Organisation for Economic Co-operation and Development (OECD), Paris, France

Presenter: Nazar Almeida Filho, President, Universidade Federal de Bahia, Brazil

Kiliman Lecture
A Higher Priority for Higher Education: Two Perspectives
Lectures: The Hon. Bill Rankin, Goodmans LLP, Toronto, Canada
The Hon. Ken P womit, Carnegie Professor of Public Affairs, Columbia University, United States of America

Disciplines and Transdisciplinarity
Beyond Initiatives: The Problematic Institutionalization of Interdisciplinary Graduate Degree Programs in American Research Universities
Iwan Felly, Emeritus Fellow, Honorary Senior Scientist, American Association for the Advancement of Science, United States of America

Interdisciplinarité de disciplines interdisciplinaires, l’exemple de recherches pour l’enseignement en France
Michel Genest, Emeritus, Centre national de la recherche scientifique (CNRS), Centre d’étude des rationalités et des savoirs, Tours, France

Catalyst Inter- and Multidisciplinary Research and Training: A View from the NIH Roadmap
Lawrence A. Tabak, Director, Department of Health and Human Services, National Institute of Health, National Institute of Dental and Craniofacial Research, United States of America

Presenter: Stephen Rowland, Professor of Higher Education, University College London, United Kingdom

Policy of Innovation
Commercialization Performance Indicators: Universities in North America, Australia and the UK
Bruce P. Clayman, President, Great Northern Way Campus, Canada

Tracer of Knowledge
Society for Economy of Higher Education – Rethinking the Teaching-Research Nexus from a European Perspective
Ulrike Fink, Professor, Institut für Wissenschaftsforschung, Universität Wien, Austria

Presenter: J-Adam Hollbrook, Adjunct Professor and Associate Director, Center for Policy Research on Science and Technology (CPRST), Simon Fraser University, Canada

Public Private Partnerships
IT Enabled Higher Educational Systems: A Paradigm Shift
Fred Muenemann, Luminous Crafts Professor of Engineering, Director, Center for Technology, Policy and Industrial Development, Director, Technology and Development Program, Massachusetts Institute of Technology (MIT), United States of America

Nathanial Ogunj, Research Associate, Technology and Development Program, Senior Lecturer, CEE, Massachusetts Institute of Technology, United States of America

Graduate Education: Permeable Public-Private Boundaries and Shifting Definitions of the Public Good and Private Interest
Shoia Slaughter, Louis McRae Professor of Higher Education, Institute for Higher Education, The University of Georgia, United States of America

Presenter: Benoit Godin, Professor, Centre National de la Recherche Scientifique (CNRS), Université de Montréal, Canada

Ethics and Ethical Issues
Population Databases: Global Public Goods
Bartha Maria Knoppers, Chaire de recherche du Canada en droit et médecine, Université de Montréal, Canada

The Challenge of Research Ethics in Graduate Education
Michael McDonald, Maurice Young Chair of Applied Ethics, University of British Columbia, Canada

Presenter: Nicholas H. Steneck, Professor, Department of History, Consultant, Office of Research Integrity, University of Michigan, United States of America

Global Impact of Innovation in Graduate Education
Graduate Education in Central America
Gabriel Macaya, CIBICM, Universidad de Costa Rica, Costa Rica

Graduate Education in India
R. Narasimhan, Chairman, All India Council for Technical Education, India

The Impact of Globalization in Graduate Education in Developing Regions
Anthony G. Oeh, Dean, Graduate School, The University of Hong Kong, China

Presenter: Barbara Evans, Dean, School of Graduate Studies, University of Melbourne, Australia

Movements in Indigenous Graduate Education and Building Capacity Through Indigenous Graduate Student Support
T’hothahoken Michael Doxtater, Director, Indigenous Studies in Education Research and Teaching, McGill University, Canada

The Indigenous Graduate Revolution in New Zealand and the Potential for First Nations in Canada
Graham Hingarpessa Smith, Pro Vice-Chancellor (Maori), University of Auckland, New Zealand

ACADE, the CIHR-IAF Focus on Building Capacity for Graduate Student Support in Indigenous Peoples’ Health Research
Jeff Reid, Scientific Director, Canadian Institutes of Health Research - Institute of Aboriginal Peoples’ Health (CIHR-IAPH), Professor, Faculty of Human and Social Development, University of Victoria, Canada

Presenter: Denise K. Henning, Ph.D., Executive Director, International Student Success Professor, University of Regina, Canada

Women in Academia
Globalising Inequalities: Women Academics in Commonwealth Universities
Louise Morley, Professor of Education, University of Sussex, United Kingdom

Recognizing Women Graduates in the Proposition: An Assessment of the Barriers
Teresa A. Sullivan, Professor of Education, Université de Montréal, Canada

Presenter: Nicholas H. Steneck, Professor, Department of History, Consultant, Office of Research Integrity, University of Michigan, United States of America

Claire Deschênes, Chaire CRNS-Alcan pour les femmes en science de génie au Québec, Université Laval, Canada

Preface

Mark Dale
President, Canadian Association for Graduate Studies

graduate education is directly linked to one of the most significant features of contemporary society, the central role of science and knowledge. Accordingly, our 2006 international conference explored the complex relationship between innovation and graduate studies.

The Conference examined both the influence of discovery on teaching and research, as well as the impact of graduate studies on innovation and the knowledge economy. The gathering gave rise to highly stimulating discussions and identified some of the challenges facing universities to meet the needs of modern society. We are happy to share this summary of the Conference with you and we are convinced that you will find it worth your time and effort.

We would like to express our sincere appreciation to the international experts on higher education who spoke at the Conference and who set the tone at a remarkably high level.

The Conference participants maintained a fruitful dialogue throughout the meeting and are to be commended. We also want to thank members of the Programme Committee who laid down the broad lines of the Conference, and Dr. Wendy Hough-Eyamie, who worked as a researcher and wrote the synopsis, as well as Joelyne Vézina-Allard and Dr. Jean-Pierre Gaboury of the national office. Finally, we are extremely grateful to our sponsors: the Canadian Institutes for Health Research, the Natural Sciences and Engineering Research Council of Canada, the Social Sciences and Humanities Research Council of Canada, the Ministry of Training, Colleges, and Universities of Ontario, UMI/ProQuest, the Killam Trusts and the three Toronto universities; Ryerson University, the University of Toronto, and York University. Such broad support is remarkable and allowed us to hold a Conference of such high standing.
There are at least two key elements of this transformation to a knowledge-based economy: innovation and globalization. Innovation refers to the development of new technologies and the expanded application or uses of these technologies. Technological advances have resulted in an unprecedented proliferation of knowledge and an ever-expanding set of tools for its distribution. Implied by the term innovation is an increased commercialization of research - a shift from "pure" research producing advances in knowledge to more "applied" research producing advances in some form of tangible product with a concomitant economic benefit. This shift is also linked to increasing involvement of private investors and industry in the funding of university-based research. These investments have subsequently impacted the research process and researchers by increasing the accountability of the researcher both in terms of outcome and timeliness. Researchers find themselves in the process of shifting from involvement in the "process" of research to the "management" of research. Likewise, the governance of universities has taken a decidedly managerial or corporate shift in response to innovation, for example, many universities have established offices of technology transfer, engage in cost-benefit evaluation of programs and projects, and have incorporated human resource policies that favour contract-based employment of research staff.

The trend toward globalization in research and graduate education has both contributed to and been facilitated by innovation. The production of truly innovative research is enabled by bringing together the best people, resources, and facilities to tackle the question at hand. This has resulted in research collaborations that extend beyond the boundaries of traditional disciplines, institutions, and nations. Networking, collaborations, and partnerships have become commonplace forms of academic inquiry and exchange. Of course, globalization has been facilitated by innovations in communication that make access to information virtually borderless and instantaneous and by the standardization of products and services around the world. This technology has also resulted in enormous potential for global e-education which is yet another front on which the traditional university faces market pressures as it is pulled into competition with for-profit institutions that offer quick and convenient access to higher education through e-learning.

Together, the processes of innovation and globalization prevalent in today’s knowledge economy are having a significant impact on the very core of the traditional university and its key functions of research and teaching. This period of transition provided the context for our discussion of Challenges to Innovation in Graduate Education.
The ongoing struggle to foster and develop transdisciplinarity in research extends to graduate education. Students trained in transdisciplinary programs continue to face a number of hurdles including difficulties finding academic employment and devaluation of non-academic career options.
by trends toward increased teaching loads related to the development of mass education in response to the demands of the knowledge economy for a vast number of knowledgeable workers. These changes in both research and teaching roles are coupled with an inadequate salary structure and the movement in university human resource policy toward contract-based employment. The net result of which is that many young researchers are less attracted to academic careers.

This discussion raises a number of questions pertaining to the training of tomorrow’s scientists such as what are the requisite skills they have to learn, are universities prepared to train students in non academic competencies and what is the role of the graduate student within the university, and how should they be socialized.

Within the current academic climate there has been a multiplication of tasks for which the researcher is responsible.

Ethics and ethical issues

Innovative scientific advances have served to highlight the importance and complexity of ethical considerations in research. As an example, human genetics research illustrates the myriad factors that must be considered from an ethical perspective - the right to anonymity for participants and the right to know; conversely not-to-know any diagnosis, prognosis, or other relevant health information as it applies to the individual, family, or community. The global sharing of genetic information will undoubtedly expedite the research process; however, such borderless distribution of data not only produces logistical issues related to harmonizing terminology but also extends the responsibilities of the researcher to include consideration of the ethical standards of the “importing” country. Finally, the open sharing of genetic material and data illustrate a fundamental shift in ethical perspective from investigator or institutional ownership of data toward a more inclusive conception of genetic data as public resources or global public goods.

Education and acculturation in research ethics ought to form a central part of graduate education but, in fact, does not. Graduate students should receive formal training in the responsible conduct of research including: regulations concerning the use of animals or human research subjects (where appropriate), responsible data management and publication practices, the fundamentals of managing grants and conflicts of interest, expectations for sharing or protecting information, and obligations associated with the peer review process and reporting misconduct.

Global impact of innovation in graduate education

Discussion of the challenges of innovation to graduate study in the global context revealed an interesting continuum of impact related to the stage of development of graduate education in the region. For example, the impact of globalization in Central America is overshadowed by recent “catastrophic” histories, both natural and political. Graduate studies in this region are a relatively recent development and are characterized as being highly diversified across countries and institutions, with no standards of excellence in operation, and not linked to research but are more market driven with a focus on professional training. They face considerable developmental problems such as achieving a critical mass of faculty and students, small academic communities, and redundancy. Although innovations such as globalization may ultimately serve to enable the development of graduate studies in Central America, in its existing stage of infancy its impact is relatively negligible.

The current state of graduate studies in India represents an intermediate position on the continuum of innovation impact. The technological advances and forces of innovation associated with the movement toward a knowledge economy have resulted in many of the brightest students being attracted to private sector industry and management schools. Likewise, globalization has resulted in a number of students being drawn to study and research abroad programs. Not only have these forces produced a decline in graduate student intake and output, they have resulted in an acute shortage of faculty.

Public–private partnerships

Although, overall, universities have been rather slow to make this transformation as administrators have forced the poles between public and private research activities to stay separate, the emergence of the knowledge economy has resulted in the proliferation of public-private partnerships and the blurring of definitions of public, non-profit, for-profit organizations. These partnerships have created a new set of roles for graduate students as inventors, innovators, and entrepreneurs which, in turn, have produced a number of unexpected educational dilemmas surrounding issues of intellectual property ownership and the power relationships, rights and responsibilities of professors, students, and universities. In order for students and universities to participate fully and to mutual benefit in the entrepreneurial process, policies and procedures must be clear and explicit and not part of the “hidden curriculum.”

Aimed at both quantitative expansion and qualitative improvement of graduate studies programs, a number of periodic reviews have been commissioned. These reviews produced a number of recommendations regarding how to attract more students to graduate education, necessary modifications to existing programs to ensure that the needs of the industrial and strategic sectors are met, and how to ensure that employment opportunities exist for graduates.

Examination of graduate studies in Hong Kong exemplifies the extreme position on the continuum of the impact of innovation on graduate studies and research. In the recent past, institutions and researchers in this part of the world were considerably limited in their access to information and equipment. The focus of research was to deal with meeting local needs with little consideration of issues concerning the outside world. As is the case in India, a number of students chose to study abroad because of both academic and economic reasons. However, forces of innovation and globalization including the faster and freer flow of products, information, and people have served to bring Hong Kong’s institutions and researchers into a competitive position with other regions in international benchmarking exercises. Researchers are tackling some of the worlds’ most pressing questions, and there has even been a reversal in the flow of graduates back from developed regions. In this case, innovations have served to strengthen educational and research institutions and programs.
movements in indigenous graduate education

The expansion of graduate education into developing regions of the world in which sexual equality has neither been the cultural norm nor priority serves as another important reminder of our social responsibilities in the process of globalization.

women in academia

Although there have been a number of gains in relation to women’s access to graduate studies as students in most areas of study, there remain a number of obvious gender inequalities in academia including a lag in female enrollments in graduate studies in the physical sciences and engineering as well as a lower representation of women on faculty even when field is controlled for. This discrepancy also holds in terms of women’s representation in university management. The question, then, becomes what are the factors that account for these discrepancies? Two potential hypotheses have been put forth related to female representation in the professoriate: one relating to differences in the socialization of male and female graduate students and the other to the suggesting that the university is a particularly unappealing workplace for women. Research into the underlying reasons for these inequalities is crucial if we are to understand the nature of the barriers that exist for women in the academy and if we are to provide graduate training that will serve to remove them.

The expansion of graduate education into developing regions of the world in which sexual equality has neither been the cultural norm nor priority serves as another important reminder of our social responsibilities in the process of globalization. For instance, recent research into the status of women in low-income Commonwealth universities revealed that a number of discriminatory practices, gendered and exclusionary processes. However, this research also revealed a number of ways in which gender equity is being promoted including national and institutional policy development for gender equity, staff development and mentoring programs, and perhaps most importantly through international collaborations and networking opportunities. These findings have important implications as the knowledge economy provides a driving force behind higher education in many lesser developed parts of the world - there is an opportunity to either enable women globally through internationalization or to turn a blind eye to discriminatory practices.

conclusions

Policies of innovation, public-private partnerships, and the process of globalization have had significant impacts on the quotidian functioning of universities and the “enterprise” of university-based research. The emerging “corporate” university is characterized by its sensitivity to market pressures such as putting a premium on research agendas that are flexible and responsive to market demands, productive, and well-managed and by its commodity-based view of higher education. Seen in this light, “the institutional goal of the university could be the production of graduates and patents.” The enabling of this transition by the institutions themselves is a reflection of the “pro-innovation bias”: the assumption that innovations are not only new things but are beneficial if not necessary. However, there are a number of caveats related to this assumption and the evolutionary state in which our educational institutions find themselves presently.

First, we need to objectively evaluate this process of adaptation. We must consider that “the critical ability to adapt” can mean very different things: it can mean the ability to adjust one’s behaviour in order to fit in with changes over which one has no control, or it may, on the contrary, mean the ability to critique and challenge the situation in which one finds oneself. It is important for us to see innovation in terms of critique and challenge as well as in terms of more conciliatory forms of adaptation. Responding to innovation without an adequate degree of reflection on the consequences of this responsiveness could result in a situation of “over-adaptation” as exemplified by the unusual sensitivity to external change that has developed in some countries and institutions, reinforcing a constant flow of short-term adjustments that tend to blur the overall direction of the institution’s development, thus making it hard to evaluate the full impact of the decisions taken. The earlier discussion of the changes to the system of graduate education in India could be interpreted as an example of such over-adaptation.

Another over-riding concern relates to the differential impact of innovation and globalization on lesser developed regions or already marginalized social groups: “copyrights and patents protect knowledge and artistic production of industrialized countries while their technological and cultural goods flow onto developing nations, taken as mere consuming markets destined to pay royalties and revenues.” This mentality extends to universities and educational institutions that have come to consider higher education as a commodity for export as opposed to a public good. Our discussions of Indigenous peoples and women in academia also served to illustrate that the forces of innovation and globalization can exacerbate already existing forms of social inequalities.

The third issue relates to important contribution of the established disciplinary structure of universities. Notwithstanding the genuine need for interdisciplinary collaboration, it is clear that disciplinary distinctions permit a form “interdisciplinary context” that is vital to the academic value of critique. In particular, the distinct roles to be played by the sciences and humanities as universities and researchers grapple with this innovation-based transformation must be recognized and, to a certain extent, fostered. Clearly, the sciences will produce the lion’s share of the fodder needed for the knowledge economy while the equally invaluable role of the humanities will be the teaching of skills related to “critical reflexivity, the need to understand different cultural identities, and concerns for social justice” and, perhaps most importantly, the protection of academic freedom itself.

The final proviso relates to the sustainability of the knowledge economy. The growing dependency of universities on predominantly short-term relationships with non-university partners makes long-term programs of research difficult to implement and makes it very difficult to move beyond a focus on the immediate interest. It has been suggested that we need to look farther than the needs of the knowledge economy toward a more sustainable “knowledge ecology.” In a similar vein, are warnings of the need to allow for
the exceptional in the research domain – “most innovations have one thing in common, they are neither planned nor predictable”\textsuperscript{14}. While universities and researchers are focused on output, budgetary considerations, and timelines, they may overlook the potential innovations they are so desperate to produce.

Considering both the forces related to innovation on the university research enterprise and the caveats cited above, what, then, is the nature of the educational institution to which we aspire for the future? First and philosophically, we must consider that “as builders of such peculiar historical institutions that never cease to evolve … we are in a privileged position to conceive, proportion, and realize a renewed university for our societies, one that shall become a tool for social integration instead of an institution for social exclusion as it has been for almost a thousand years”\textsuperscript{15}. Further, in this process of reinvention we must realize that “academia is not confronted simply with an add-on situation … what is at stake is a qualitative leap that can integrate an expanded spectrum of activities; within the framework for these new conditions, this calls for a redefinition of universities of activities; within the framework for these new conditions, this calls for a redefinition of universities as institutions. New grounding, new blending and new balances are required to re-engineer the academic institution to which we aspire for the future? First and foremost: a necessary bootstrap toward a more global orientation. Firstly, it is clear, that innovation has had a significant impact on graduate education – or at least what is required for successful graduate education in the context of the knowledge economy. The question remaining is what is the impact of graduate education on innovation? The answer to this question depends upon our success in actively shaping and transforming our universities and providing students with the skills made requisite by innovation itself. If we are successful in this endeavour, the ultimate impact of graduate education on innovation is unlimited.

It is clear, that innovation has had a significant impact on graduate education – or at least what is required for successful graduate education in the context of the knowledge economy. The question remaining is what is the impact of graduate education on innovation? The answer to this question depends upon our success in actively shaping and transforming our universities and providing students with the skills made requisite by innovation itself.

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“Thanks to science and technology, access to factual knowledge of all kinds is rising exponentially while dropping in unit cost. It is destined to become global and democratic. Soon it will be available everywhere on television and computer screens. What then? The answer is clear: synthesis. We are drowning in information, while starving for wisdom. The world henceforth will be run by synthesizers, people able to put together the right information at the right time, think critically about it, and make important choices wisely.”

Edward O. Wilson, taken from his book entitled, Consilience, The Unity of Knowledge\textsuperscript{16}:
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