



UNIVERSITY OF
ALBERTA

Final Report

Working Group on
Teaching and Research

Integrating Research and Teaching at the University of Alberta:

*Creating a Foundation for an Inquiry-
Based Life*

October 2004



Table of Contents:

Executive Summary	3
I. Introduction	4
II. Research as a Public Trust	5
III. Focus for the Future: Integrating Teaching and Research	7
<i>A. Conceptualizing the Integration of Teaching and Research</i>	7
<i>B. Developing the Academic Plan for the University of Alberta</i>	8
<i>C. Facilitating the Integration of Teaching and Research</i>	11
IV. Environmental Scan of the Current Situation at the U of A	13
V. Next Steps	18

Appendices: (see supplementary document)

- Appendix A - Current Scholarship on Integrating Teaching and Research**
- Appendix B - The Boyer Commission and Jenkins Strategies**
- Appendix C - Faculty of Agriculture, Forestry, and Home Economics**
- Appendix D - Faculty of Arts**
- Appendix E - School of Business**
- Appendix F - Faculty of Education**
- Appendix G - Faculty of Engineering**
- Appendix H - Faculty of Extension**
- Appendix I - Faculty of Graduate Studies and Research**
- Appendix J - Faculty of Law**
- Appendix K - Faculty of Medicine and Dentistry**
- Appendix L - Faculty of Nursing**
- Appendix M - Faculty of Pharmacy and Pharmaceutical Sciences**
- Appendix N - Faculty of Physical Education and Recreation**
- Appendix O - Faculty of Rehabilitation Medicine**
- Appendix P - Faculté St. Jean**
- Appendix Q - Faculty of Science**
- Appendix R - What is the Research Profile Project?**

Executive Summary

The University of Alberta (U of A) is a research-intensive university, with research revenue expected to exceed \$400 million in the coming fiscal year. The U of A consistently places in the top five in research funding from each of the three federal granting agencies. The graduate enrollment at the U of A is climbing to an estimated 6000 for the coming year and undergraduate enrollment is approximately 30,000 students. This continued success in student recruitment and research has also come at an increasingly difficult time for the base-operating budget of the university. The challenge in the future is to maintain a record of achievement and success.

Over the past several years there has been a debate about whether the goals of a research-intensive university are fundamentally at odds with an optimal undergraduate learning environment. Additional research oriented resources could either significantly enhance or detract from the undergraduate learning environment. At present, there is little objective information to determine the link between research and the undergraduate learning environment.

Dr. Gary Kachanoski, Vice-President (Research) of the University of Alberta, in conjunction with Dr. Mark Dale, Dean of the Faculty of Graduate Studies and Research, created the Research Profile Project to examine the connection between research and teaching and to articulate this connection to the U of A and broader community. It became immediately apparent in the initial phases of this project that it was necessary to conduct an environmental scan of the university to determine what faculties were doing to connect teaching at the undergraduate level and the research enterprise. To facilitate the scan, and oversee the creation of a summary report, an adhoc-working group of interested individuals from across campus was created. The Working Group on Teaching and Research met from December 2003 to August 2004 to complete the scan of the undergraduate learning environment, to assess the scan based on the frameworks laid out in the Boyer Commission report and the recent work by Jenkins (et al.), to identify best practices to be celebrated and shared across campus, and to make a series of recommendations on how to better connect teaching and research for undergraduate students at the University of Alberta.

This report is the culmination of the working group's efforts and is meant to engage the U of A community in the discussion on how we can better enhance the undergraduate learning environment through the connection of teaching and research.

I. Introduction

The U of A is committed to being one of Canada's finest universities, and among a handful of the world's best, in teaching, research, and community service. However, as the operating budget of the university continues to constrain faculty budgets and the research budget of the university continues to grow, there has been a perceived tension between these core mandates. The teaching-research connection has been discussed repeatedly within the university community and throughout the greater academic community. There have been numerous proponents of the view that the undergraduate learning environment continues to be enhanced by the additional resources received at the university for research. There have been almost as many who claim that the expanding research enterprise takes away from the undergraduate learning environment. In neither case, has there been conclusive evidence that there is or is not a disconnect between the teaching and research mandates of universities.

The University of Alberta is not alone in trying to address this perceived conflict. In 1998, the Boyer Commission made a series of recommendations to the research-intensive universities across the United States.¹ This has been followed up by a report in 2002 on the initial success of implementing these initiatives across the country.²

In 2003, Alan Jenkins (et al.) published a comprehensive study on this issue focused on the United Kingdom, though it includes an analysis of and examples from the United States, Canada, Australia, and New Zealand.³ This study, called *Reshaping Teaching in Higher Education: Linking Teaching and Research*, lays out a series of strategies to be implemented at the program, department, faculty, university, and national levels to better integrate research into the undergraduate classroom. These are just a few of the *numerous publications* that have begun to analyze the teaching and research connection in the modern university.

Dr. Gary Kachanoski, Vice-President (Research) of the University of Alberta, in conjunction with Dr. Mark Dale, Dean of the Faculty of Graduate Studies and Research, created the Research Profile Project to, among other things, examine and articulate the teaching-research connection to the U of A community. It became immediately apparent in the initial phases of this project that it was necessary to conduct an environmental scan of the university to determine what faculties were doing to connect teaching and research at the undergraduate level. To facilitate the scan, and to oversee the creation of a summary report to be submitted to the Provost and Vice-President (Academic), the Vice-President (Research), and the Committee on the Learning Environment, an adhoc-working group of interested individuals from across campus was created. The Working Group on Teaching and Research met from December 2003 to August 2004 to complete the scan of the undergraduate learning environment, to assess the submissions based on the frameworks laid out in the Boyer Commission report and the recent work by Jenkins (et al.),

¹ University of Stony Brook, *The Boyer Commission. Reinventing Undergraduate Education: A blueprint for America's Research Universities*. New York: Stony Brook (1998).

² University of Stony Brook, *Reinventing Undergraduate Education: Three Years After the Boyer Report*. New York: Stony Brook (2002).

³ Jenkins, A. (et al.), *Reshaping Teaching in Higher Education: Linking Teaching with Research*. London: Kogan Page Limited (2003).

to identify best practices to be celebrated and shared across campus, and to make recommendations on how to better connect teaching and research for undergraduate students.

The members of the working group are:

Dr. Olive Yonge, Associate Dean, FGSR (and Chair of the Working Group)
Dr. Bill Connor, Vice-Provost and Dean of Students (and Vice-Chair)
Dr. Gary Kachanoski, Vice-President (Research)
Dr. Lesley Cormack, Department Chair of History and Classics
Dr. Frank Robinson, Associate Chair of Agricultural, Food and Nutritional Science
Dr. Gordon Swaters, President of the Association of Academic Staff
Dr. Tom Chacko, Vargo Teaching Chair in Earth and Atmospheric Sciences
Dr. Erhan Erkut, Vargo Teaching Chair in the School of Business
Lee Skallerup, President of the Graduate Students' Association
Mat Brechtel, President of the Students' Union⁴
Dr. Connie Varnhagen, Professor of Psychology
Dr. John Hoddinott, Professor of Biological Sciences
Dr. Margaret Haughey, Professor of Educational Policy Studies
Brad Wuetherick, Special Projects Officer, Research Profile Project

II. Research as a Public Trust

Teaching and research are core mandates of the U of A; in fact, most would define a university (as a distinct social institution) by the co-existence and linkage of these core mandates. The linkage of student learning and research at universities is not a coincidence. A social contract exists among universities, society, and public investment in university research. It is by design, and flows from public policy at both the federal and provincial government levels. The nature of the social contract has been influenced substantially by post-World War II public policy, particularly in the USA. This is evident by the support of university research through the creation (in the USA) of the NSF, NIH, etc, in the 1950s, and the subsequent creation (in Canada) of the Tri-Council funding agencies in the 1970s. Frank Rhodes, former President of Cornell University, in his 2001 work *The Creation of the Future: The Role of the American University*, articulated this concept of research as a public trust.⁵

A simplified interpretation of the social contract has public funds for research flowing to universities with the central justification that the research will be linked to the education and training of students. The linkage of university research and student education and training is explicit in the policies of the federal Tri-Council funding programs (i.e. the inclusion of training of highly qualified personnel in all Tri-Council funding applications and funding criteria) and in the HR component in the new federal Innovation Agenda. In addition to student education, the expectation was that society would benefit from research through improved quality of life, health, expanding economy, national security, and private wealth creation.

⁴ Lisa McLaughlin, VP (Academic) of the SU as of May 2004, was instrumental in the final meetings of the working group and deserves to be recognized as well.

⁵ Frank Rhodes, *The Creation of the Future: The Role of the American University*, New York: Cornell University Press (2001).

The linkage of public funding for research and university education has been recognized as one of the most important factors in the significant growth of prosperity and technological advances in the post-war era. This strategy supplied faculty for the rapid expansion of universities in the 1960s and subsequent emergence of more graduate programs and enrollment, particularly PhDs, in the 1970s and 1980s. The linkage of training and research is explicit for Post-Doctoral Fellows and doctoral programs. However, the relationship between research and undergraduate teaching/learning is less explicit than for graduate education.

A number of studies such as the 1998 Boyer Commission have examined the linkage and argued universities need to strengthen the quality of undergraduate education by linking better the immense resources of their graduate and research programs to undergraduate learning. The Boyer Report outlines 57 recommendations and a follow-up report indicates many of the recommendations are being widely (if unevenly) adopted in large USA research universities. Canadian universities have never had the same research intensity and focus on graduate education as the large USA research-intensive universities (e.g. graduate enrollment at these universities tends to be 25% of total student enrolment compared to 10-15% in Canada; U of A is approximately 14%). Nevertheless, the issue of the balance between teaching and research at the U of A is an important discussion.

The recent increase in research funding to universities, coupled with inadequate university core base funding, major cost increases outside of the university's control (largely relating to energy costs for heat/cooling/lights, etc), and increasing undergraduate tuition have all fueled a debate that undergraduate education and learning is undervalued relative to research. Enrollment numbers, however, suggest the U of A has maintained its historic support for undergraduate access despite significant fiscal restraint. In 1992, the U of A had an undergraduate enrollment of approximately 22,000 and the number of full-time faculty was approximately 1750. Currently, the undergraduate enrollment is approaching 30,000 and the number of full-time faculty is 1650. The increase in undergraduate student teaching load has been partially offset by an increase in the number of sessional instructors and a significant increase in the number of externally funded research chairs (Canada Research Chairs, endowed professorships, NSERC chairs, etc) which can be involved with undergraduate teaching. In fact, it can be argued the growth in undergraduate enrollment (even with rising entrance standards) and demand for more access to undergraduate education is a source of enormous stress on the base budget. Increased undergraduate enrollment has been only partially funded through Alberta Learning Access programs, or not funded at all other than through tuition fees paid by these additional students.

The Association of Universities and Colleges of Canada (AUCC) submitted a brief to the House of Commons Standing Committee on Finance on 8 September 2003 stressing the realization of Canada's research and development targets (moving Canada's investment in R&D from 15th to 5th in the world and double funding for the three federal granting agencies between 2000 and 2010) will require building on recent federal initiatives. The brief stressed it is essential the educational mission of universities be revitalized, and Canadian universities must have the institutional capacity to provide quality education to a growing number of students.

There are many definitions of a "Research or Research-intensive University", but all include a substantial commitment to doctoral education and organized research, usually across disciplinary,

interdisciplinary and multidisciplinary interests. Graduate enrollment at the U of A, particularly at PhD level, has not increased as significantly as would be expected given the increase in research funding. Overall, graduate student enrolment has increased by 18% since 1994-95, with PhD enrolment up by approximately 14%. Graduate programs in medicine and engineering increased by 33% in the same period. The ratio of graduate to undergraduate enrolment has stayed approximately constant or dropped slightly over the past eight years, primarily because graduate enrollment growth has not kept pace with the growth of undergraduate enrollment.

III. Focus for the Future: Integrating Teaching and Research

The Working Group on Teaching and Research has endeavored to identify best practices currently used or being implemented as an effective means of integrating teaching and research. The working group is also recommending these recommendations form an integral part of the academic plan being developed by the U of A as it moves forward as one of Canada's best institutions of higher education.

A. Conceptualizing the Integration of Teaching and Research

1. Cultural Shift - The University of Alberta must continue to develop as a learner-centered institution and continue to develop ways to integrate research into the learning environment to enhance the undergraduate experience.

The University of Alberta must work to promote a culture shift on campus where the integration of teaching and research and our commitment to the learning environment for our students are an integral part of the overall campus environment. If we continue to change the culture of campus to a learner-centered institution to make the integration of teaching and research the norm, and to keep the learning environment at the fore, many of the other issues related to the integration of teaching and research will be much easier to address, if they are not addressed already.

2. Values and Principles – The University of Alberta needs to state its commitment to its learning environment and its commitment to integrating teaching and research.

This commitment to the learning environment and the integration of teaching and research needs to be a core principle in the development of the University academic plan, as well as a core part of every faculty, department, and individual unit business plans.

All undergraduate programs at the U of A should work towards ensuring the following three research-focused goals are included in their current educational goals – develop an understanding of research in the discipline, develop research skills necessary in the discipline, and provide a direct research opportunity.

3. Environmental Scan – The University of Alberta should continue to scan the current practices on campus with respect to the integration of teaching and research.

It is essential to continue to gather centrally different best practice examples to share across campus among faculties and departments. By reporting on our practices, we are able to learn from each other what does and does not work, and we are able to celebrate the success stories related to teaching and research.

4. Review Policies and Procedures – The University of Alberta should review its policies and procedures specifically around the integration of teaching and research.

The University of Alberta should work to review its policies and procedures related to the integration of teaching and research and develop strategies to improve the way we facilitate the teaching-research connection. This includes reviewing the academic and research policies at the Board of Governors, General Faculty Council, central administration, faculty, and departmental level.

B. Developing the Academic Plan for the University of Alberta

As the University of Alberta moves towards developing an Academic Plan for the future, it is essential to be mindful of ways to ensure students have the following opportunities:

1. Experiencing and Doing Research - Students must have opportunities throughout their programs to experience and conduct research.

All undergraduate students at the U of A should have opportunities to experience and conduct research starting in their first year. Faculties need to have specific research courses. There could be a course option allowing students to get experience undertaking a research project. The recent initiative in the Faculty of Science to implement Biological Sciences 299 and Chemistry 299 is one example of a best practice in this area. In these courses (which are being implemented on a department by department basis) students can gain research experience in an active research laboratory commensurate with their skills and abilities. The faculty member serving as an advisor must agree to the class and normally the undergraduate students are mentored in the lab by senior undergraduate and graduate students. Though there are already numerous other similar examples, these courses could be replicated across campus where possible.

Related to this, programs could be encouraged to develop research courses or research opportunities that partner undergraduate students with members of industry or the broader community. There are several great examples of this including the GeriActors in Drama, the Designing with Children initiative in Art and Design, and Animal Science 471 in AFNS. Students could also be encouraged to attend research and training field schools offered for undergraduate students. These include the various archaeological digs run by Anthropology and History and Classics, as well as the Earth and Atmospheric Sciences and Biological Sciences field schools.

As well, an internship/practicum experience provides a hands-on, practical experience for students. Where possible, the options of completing an internship or practicum with a U of A research lab should be made available to students. A number of faculties at the U of A already have an internship or practicum experience. Two examples of successful internships allowing

students to have a hands-on research experience are the Pharmacy research internship (where approximately ten students per year undertake research in a lab on campus or at an industry partner) and the research internship in the AFHE (where students can work in a research lab on campus or at an industry partner doing research). There are numerous other examples of internships or practicum experiences in the Faculties of Nursing, Education, Business, Engineering, Medicine and Dentistry, Arts, and Science. The internships/practicums need to link research into the learning experience.

All programs could have a capstone project/course/experience not just restricted to honours or specialization students. For example, the Engineering capstone design/project course required of all Engineering students, is a great mechanism for bringing the research skills developed throughout the entire program together in a final project. Several other faculties, including Education and Pharmacy, have expressed the importance of a capstone practicum as critical to integrating teaching and research in their respective programs.

The U of A could enhance undergraduate student involvement in faculty members' research projects through increasing the summer research opportunities in each faculty and encouraging faculty members to include summer research students as part of their requested budget for research grants. There are several programs that help to fund undergraduate researchers over the summer, including NSERC, AHFMR, CIHR, and WISEST. The Vice-President (Research) has recently started an Undergraduate Student Research Award initiative with the Deans of Arts and Native Studies to have fifteen and two students respectively conduct summer research. Related to this, the U of A could administer a research grants program for conference travel funding. This would expose students to a broader research community and advertise the research excellence of the U of A.

2. Learning About Research - Students must have opportunities throughout their programs to learn about research.

All U of A students should be offered opportunities to learn about the diverse research being conducted on campus. Within their classes, faculty members should take the time to explain the relevance of the course material to research they or others are conducting in the discipline. They should also explain the importance of research in the discipline and link it back to the content of the course they are offering. This is critical to getting students excited and interested in the discipline and perhaps motivating them to pursue a career in research.

The U of A should, where feasible, involve undergraduate students as participants in research projects. This is already being done in introductory level Psychology and MLCS courses with great effectiveness.

The U of A could develop mentoring programs for undergraduate students (either with senior undergraduate students, graduate students, faculty members, or alumni) to help them develop a greater understanding about research. For example, the Faculty of Physical Education and Recreation has recently initiated a program that partners PhD students with senior undergraduate students in a mentoring relationship to introduce the students to research projects.

Resources brought into the U of A from research grants, including research facilities, research collections (library and museum), and research equipment, benefits undergraduate students. For example, use of the museums and collections across campus could be integrated into course work. Medicine and Dentistry, Pharmacy, and other related faculties use their NMR facilities and other equipment in undergraduate laboratories. Arts uses their Humanities Computing Studio and the Streetprint Database, funded by the Canadian Foundation for Innovation and the Canada Research Chairs program, for undergraduate courses on humanities computing. Students in Engineering have access to the Nanofab Laboratories in the Electrical and Computing Engineering Research Facility.

The U of A could mandate all research centers and institutes demonstrate their connection to the undergraduate learning environment offered by the faculty or department they are affiliated with. An example might be a seminar for students in related programs.

3. Developing Research Skills - Students must have opportunities throughout their programs to develop research skills.

Faculty members should be encouraging the development of research skills in their courses at all levels of study. Courses could have both an oral and written component, and emphasize the development of critical thinking and problem solving skills. Ideally, grading should be based on an understanding of course material, and an ability to communicate that understanding to both academic and general audiences. Most senior undergraduate classes/seminars require students to complete presentations on different issues in class and prepare a research paper at the end of the course. These skills need to be emphasized throughout the entire undergraduate curriculum, particularly through the use of a first year seminar-based course. For example, Psychology has adopted a systematic approach to incorporating research and teaching in all four years of their program, including mandatory participation in research projects in the first year through to conducting research projects in the fourth year.

Joint projects and collaborative efforts need to be encouraged in courses. There are a number of best practices that can be highlighted from the environmental scan of the faculties demonstrating an effective use of collaborative work. For example, Engineering's senior design/project courses are mandatory for all engineering students. A small group of students work together to research a project of interest to the students, bringing together all of their previous coursework into a capstone experience. Another example is the mandatory BUS 201 class where students in a large 400+ student class are divided into small groups to research and prepare a business plan, involving business leaders from the community as mentors.

Related to this, all undergraduate students could receive training on basic computer skills, including word processing, presentation software, spreadsheets, and any other software related to the discipline. Education has a mandatory course on computer skills that every education student must take.

The U of A could implement a first-year seminar class in each faculty or department that introduces students to research, emphasizes oral and written communication skills, and develops

students' critical thinking and analysis skills. The course should emphasize explanation, analysis, and persuasion and should develop the skills of brevity and clarity.

4. Setting the Foundation for an Inquiry-Based Life - Students must be encouraged to develop as lifelong learners.

The U of A student learning environment should work to ensure that students graduate not only with a comprehensive understanding of their discipline but also with research, critical thinking, and communication skills. Students should graduate with both the ability and desire to be lifelong learners.

C. Facilitating the Integration of Teaching and Research

1. Professional Development - The University of Alberta should provide effective professional development opportunities for all academic staff on the integration of teaching and research.

The U of A should continue to emphasize the importance of ongoing professional development by our faculty and graduate students. The Research Profile Project, in collaboration with UTS, CNS, and ATL, could organize a series of workshops to engage the campus community with the issue of integrating teaching and research. This can be managed through existing programs such as the University Teaching Program and the UTS Teaching Effectiveness Sessions.

2. Resources - The U of A central administration must, as it develops its budgets over the coming years, ensure that adequate resources are dedicated across all areas of campus to integrate teaching and research effectively.

Adequate resources are key to the successful integration of teaching and research. There will be an increased cost across campus to integrate research into the student learning environment, including the increased needs for teaching assistants and the professional development of graduate students and faculty. The U of A community, including faculties, departments, and individual faculty members, should also attempt to identify new partners, including community groups and industry, to help provide additional resources for this initiative.

3. Administrative Structures - The U of A must ensure that its administrative structures are enhanced to ensure they facilitate the integration of teaching and research in all areas of campus.

The faculty evaluation process could be reviewed with the explicit aim of recognizing and rewarding faculty for their efforts to integrate teaching and research. Connecting teaching and research could also be considered when hiring new faculty.

The GFC Committee on the Learning Environment (CLE) could continue to work with the Provost and Vice-President (Academic) and the Vice-President (Research) and take a leadership role in the academic policy-making process regarding this initiative. This could include, among other activities, striking a subcommittee to examine the issues of effectively incorporating

transfer students into the U of A community. As well, the GFC Council on Student Affairs (COSA) could examine their role in ensuring the development of a culture of research on campus through student involvement and extracurricular activities. Each faculty and department should also review its administrative structure to ensure that they facilitate the effective integration of teaching and research.

The University of Alberta could establish a permanent office, working with both the Provost and Vice-President (Academic), and the Vice-President (Research) to ensure the sustainability of the initiative to connect teaching and research for undergraduate students. This office could be responsible for ongoing activities relating to the undergraduate student research experience, working closely with the Office of the Provost, the Office of the Vice-President (Research), the Dean of Students, the Dean of FGSR, and the GFC Committee on the Learning Environment and the Council on Student Affairs.

The central administration should continue to raise the profile of undergraduate student research opportunities through the Research Profile Project (including individual student profiles, the 'Research Makes Sense for Students' website, the development of communication materials, the development of materials for distribution to high schools across the province, etc.).

4. Celebrating - The U of A must continue to celebrate its success stories about the integration of teaching and research, and the success of students in research.

The U of A, for example, could develop a video segment to play at the Celebration of Teaching and Learning demonstrating the connection between teaching and research in undergraduate programs. Every faculty, department, or program could run a research day/conference/event allowing undergraduate students an opportunity to present their research, or to experience the research of faculty and graduate students. There could be prizes awarded to the best presenters to encourage undergraduate student participation. Student research projects could be displayed across campus, including at convocation.

Central administration and faculties could reexamine their awards for research and teaching to determine if the campus is recognizing the importance of integrating teaching and research.

5. Evaluating - The U of A must evaluate its current programs and practices to ensure the campus is meeting the needs of our students with respect to integrating teaching and research.

The U of A should create a systematic undergraduate program review mechanism similar to the existing graduate program and research review conducted by the Faculty of Graduate Studies and Research. All programs should include in this process an evaluation of the student experience of research and feed the results back into the development of the undergraduate curriculum. The existing Graduate Program and Research Review could be altered to include an analysis of how the graduate and research programs of the department benefit the undergraduate learning environment in the department.

The U of A should take the lead in forming partnerships with other universities across Canada, and around the world. One area of mutual research would be developing a benchmarking mechanism to ensure the ongoing improvement through integrating teaching and research.

IV. Environmental Scan of the Current Situation at the U of A

In 2001, the Vice-President (Research) asked for a summary of how faculties were linking teaching and research at the undergraduate level. Though every faculty did not respond and the quality of the responses varied greatly, the information gathered was used by the Vice-President (Research) to familiarize himself with the current activities of the faculties on campus and to outline aspects of the Strategic Business Plan for the Vice-President (Research) portfolio.

In December 2003 and January 2004, each faculty was asked to provide a new assessment of their current activities/programs on the same issue. For the most recent round of submissions the faculties were initially asked to follow the same template used in 2001, which included questions about the framework used by the faculty to link teaching and research, courses available to integrate a significant research aspect into the learning environment, public forums or events available for undergraduate student research, undergraduate teaching done by endowed research chairs and senior faculty members, summer research opportunities available for undergraduate students, and any other recent initiatives the Faculty has undertaken to enhance the undergraduate learning environment. The submissions were reviewed by the working group, using the Boyer Commission and Jenkins (et al.) strategies as a framework for their discussion. Faculties were then encouraged to revise their submissions to include additional areas identified by the working group. Some of the highlights of each faculty have been summarized below. All of the complete submissions are available as Appendices to this report.

Faculty of Agriculture, Forestry, and Home Economics

The Faculty offers numerous courses, particularly at the senior level, that have a demonstrable link between research and the course curriculum - for example, Animal Science 471. Almost every program has a senior research course that has resulted in conference presentations and publications, some of which have been in existence for 15 or more years. There are a large number of 'teaching laboratories' the Faculty would not possess without significant research grants and research programs. There are numerous summer research opportunities for undergraduate students through NSERC, WISEST, and industry sponsors. As well, the Faculty has recently altered its internship program allowing students to work in a research lab on campus, as well as working with other industry partners. In December 2003, the Faculty held a workshop, called 'Students Doing Research', to engage its faculty and staff in the variety of issues related to bringing research into the undergraduate learning environment.

Faculty of Arts

There are a significant number of areas where Arts has demonstrated successful leadership in this area, but the Faculty emphasized some of the problems in linking research into the curriculum, particularly in an environment where collaboration between researcher and undergraduate student is not the norm, and where faculty members have among the highest average teaching

load on campus. Within the Faculty senior seminar classes often require a significant research component. The Dean of Arts and Vice-President (Research) recently implemented the Undergraduate Student Research Awards program, which recently completed its second year funding 15 students to engage in different summer research projects with a faculty member. Almost all departments have strong honours programs requiring a thesis capstone project. There are also a number of other projects/courses in the various departments linking teaching and research, including (but not limited to): the GeriActors (Drama); the 'Designing with Children' program (Art and Design); mandatory participation in research projects (MLCS and Psychology); field schools (Anthropology/History and Classics); Undergraduate Student Research Conferences (in a number of departments including History and Classics, Psychology, Sociology, etc.); and PHIL 101 Supersections (Philosophy). A number of significant collections, including both the libraries and museums, have also been made available to undergraduate students that would not be possible without the research grants of faculty members in all departments.

School of Business

Throughout the Business curriculum there are numerous examples of research impacting the undergraduate learning environment. In a mandatory course for all incoming Business students (BUS 201), which has an enrollment of 400+ students, each student collaborates in a small group to develop business plans on selective industries (includes researching the feasibility of the plan, marketing, and presenting the plan to the class). Senior project classes often require a research component and the School has recently implemented honours programs in three departments. The Co-op program places 160-190 students in practical work experience environments each year where they get to practice research and communication skills developed in the undergraduate program. As well, the School supports a number of other activities like the annual SCOPE conference (Student Conference on Operations) where undergraduate students present research papers, some of which get published. There are also a number of research and outreach centres in the School of Business that hire students as researchers. The School boasts one of the most comprehensive Business Libraries in Canada, and the Business Building has 16 smart classes, 2 videoconferencing rooms, and a complete wireless network throughout the building, all of which are used to enhance the undergraduate learning environment.

Faculty of Education

The Faculty sees research and practice as mutually supportive and essential aspects of their undergraduate learning environment. Research and practice informs the course curriculum and field experience components of the program. Education faculty members write many of the texts used across Canada. The Faculty also builds communication and technology skills directly into requirements of the degree program. Each department includes research and research skills as an integral part of the course requirements. A required element of the education degree is the EDU 250 class - The Profession of Teaching - offering an introduction to teaching that specifically links research and practice. During Education Week researchers present their work through presentations and panel discussions/forums that include undergraduate participants. As well, the Faculty is an active supporter of the WestCAST conference where undergraduate students have an opportunity to present and participate in discussions on current research issues in education.

Faculty of Engineering

The Faculty has a number of new facilities, including state of the art research laboratories that undergraduate students can access, which would not be possible without the successful research programs of faculty members. All professors in the Faculty, including the roughly 25% who hold endowed research chairs, must teach at least one course. The Faculty has implemented the Dean's Research Awards, which pay a small stipend to an undergraduate student to engage in a research project for 1 term (culminating in a research day at the end of the year where students present their results and a prize is given out for the best project). The Co-op Program places 1200 to 3100 engineering students in a work environment where they gain a practical, hands-on research experience. Engineering has a number of student-run Discover E Science Camps, allowing undergraduate students to mentor students from the K-12 system. The Faculty also has numerous opportunities for undergraduate students to participate in research projects over the summer. As well, every program in Engineering requires students to complete a capstone project. There are numerous other design projects that place undergraduate engineering students at the forefront of engineering research (such as the SAE Aero Design project, the Autonomous Robot Vehicle project, the Formula SAE project, the Great Northern Concrete Toboggan Race, the Solar Vehicle, the Clean Snowmobile project, the CASI Glider project, and the Future Truck project).

Faculty of Extension

Extension is focused on developing, and helping the rest of campus develop, educational programs, courses and learning resources that are learner-centered, practice-focused, research-based, and technology-enabled. The EAP (English for Academic Purposes) courses in the faculty teach more than 100 international students English preparation for degree programs at the U of A. These courses are taught in conjunction with a large SSHRC grant evaluating the costs and benefits of such programs at Canadian universities. As well, the Faculty operates the Academic Technologies for Learning unit, which hires students as research assistants, and runs workshops and seminars for faculty members and graduate students across campus to better incorporate technology into teaching.

Faculty of Graduate Studies and Research

FGSR emphasizes the tremendous influence on undergraduate students by graduate students and postdoctoral fellows through a number of significant relationships, including teaching the undergraduate curriculum, supervising undergraduate research contributions, mentoring undergraduate student research, interacting with undergraduate students during the course of the research enterprise, working on collaborative research with undergraduates, or undergraduates learning about research from and with graduate students and postdoctoral fellows. To improve the ability of graduate students and postdoctoral fellows to link teaching and research effectively, the FGSR operates the University Teaching Program and the Postdoctoral Fellows Training Program, both of which offer a significant practical training for graduate students and postdoctoral fellows who are (or will be) teaching undergraduate students. The award-winning FGSR Outreach Program is also actively involved in bringing research into the K-12 education system through mentorship programs and other presentations. Outreach recently created an online journal called "*Enquiries*", which publishes research papers completed by high school students working on research projects with professors at the U of A. This had a tremendous impact on the recruitment of top high school students into the U of A.

Faculty of Law

All first year Law students take a required course on legal research. All students in their 2nd or 3rd year must complete a major research paper in a chosen field. In addition to these two courses, many senior seminars have a major research paper worth 70% or more of the final grade. In the final year of the program there are required moots that serve as a capstone for the program, involving researching and presenting cases in a court situation. There are also a number of opportunities for undergraduate students to get involved in research or to practice research skills through the Alberta Law Review, national competitive moots, national/provincial essay and publication contests, and Student Legal Services. The Faculty runs a number of workshops/conferences/public forums and students are encouraged to present and participate. There are a number of institutes in the faculty that hire undergraduate students as research assistants. As well, students have access to an excellent library with one of the most comprehensive legal collections in Canada.

Faculty of Medicine and Dentistry

Medicine and Dentistry is a discipline grounded in inquiry-based learning. In every course students must know current thinking and research in that area. The Faculty offers an MD with Special Training in Research, requiring students to undertake research projects as part of their regular program, and a joint MD/PhD, where students complete a PhD and MD together over an eight-year period. Over 130 summer research students were hosted in Medicine and Dentistry research labs in 2003, culminating in a Faculty Research Day where the students presented their results and had their abstracts published. There are numerous public forums and presentations in every department and students are encouraged to attend. Students have access to one of the most comprehensive health sciences library and journal collections in Canada. A number of departments have created undergraduate BSc programs, in conjunction with the Faculty of Science, to improve the connection to an increasing number of undergraduate students, including many that offer honours or specialization options. A problem Medicine and Dentistry is struggling with is that a large percentage of their faculty members are under external salary support restricting faculty members activity to a limited amount of time for activities outside of research.

School of Native Studies

To date the School of Native Studies has not made a submission to the Working Group on Teaching and Research.

Faculty of Nursing

The undergraduate curriculum in Nursing is entirely context-based or inquiry-based learning. Central to a professional program is the teaching and use of evidence based practice. Research skills and statistics are used throughout all courses in Nursing, including a required research course. All undergraduate students in the final year of the program must complete a preceptorship course not unlike a co-op program whereby students work with practicing nurses for a minimum of 340 hours to integrate and synthesis professional and disciplinary knowledge. Numerous textbooks referenced by students have been authored by professors in the faculty. All faculty holding Chairs are required to teach at least one course. A proposed honours program is proceeding through the governance bodies of the University. The Faculty has a small number of

summer research opportunities available for undergraduate students, AHFMER student ships and has been an active supporter of the WISEST program. Nursing also runs a student research day allowing undergraduate students an opportunity to present their work, with the best poster being given an opportunity to present at a conference. There are a number of public forums or presentations in the Faculty, particularly through the research centers. In May 2004 a new initiative, “Research Speedbumps,” was initiated in the Faculty to provide a forum for faculty and students to discuss issues and concerns about research.

Faculty of Pharmacy and Pharmaceutical Sciences

The Faculty believes strongly in the fundamentals of inquiry-based learning. Pharmacy students must engage in research and utilize research skills throughout their program requirements. The Faculty has just completed an extensive curriculum review, which is to be implemented in September 2004. Most of the equipment used by undergraduate students in their coursework and labs has been purchased through faculty member's research grants. There are some summer research opportunities in Pharmacy, including a new scholarship - the Merck Summer Studentship. As well, the Faculty has run an annual Pharmacy Research Day for a number of years, though it has not been very effective in attracting undergraduate participants. The Pharmacy program requires an internship (500 hours) and a practicum experience (16 weeks), both of which offer practical hands-on experiences in Pharmacy. The Faculty has recently had an initiative approved to have research opportunities in a lab count as an acceptable internship experience. The Faculty has also recently opened a teaching Pharmacy in SUB, which allows a combination of practical experience in a teaching environment. Generally Pharmacy undergraduate students do not continue on to graduate school, because the Pharmacy profession encourages students to enter professional practice immediately upon completion of their accreditation examinations.

Faculty of Physical Education and Recreation

Each of the areas within the Faculty offer courses throughout their programs that introduce research to undergraduate students, but also offer practicum experience in their chosen area. In Kinesiology, an initiative to create Undergraduate Research Teams has been successful in getting a group of undergraduate students to conduct a research project and present at a conference. There are summer research opportunities available throughout the Faculty, particularly studentships funded through NSERC. There is also a new initiative in the Faculty to partner senior PhD students with a group of undergraduate students to work together on a research project intended to create an understanding of the research process through a mentoring relationship with a graduate students currently doing research.

Faculté St. Jean

The approach of the Faculty is to ensure that undergraduate students acquire higher-order thinking and learning skills, and develop the knowledge and abilities required for the inquiry process (approaches to theory, inquiry, analysis and synthesis). Faculté St. Jean is currently examining their key learning objects and how best to achieve them. The Faculty is moving towards involving undergraduate students in research, through the hiring of undergraduate research assistants, and in having senior undergraduate students leading many of the science laboratories. In the *Centre de communication orale et écrite*, students are working with other students under the supervision of a professor in supporting the development of French language

skills and in diagnosing individual learning needs. In the Education sector of the Faculty, students are also involved in classroom observations and structured interactions with teachers and students. Faculté St. Jean is currently putting in place a research bureau led by an interdisciplinary team of faculty members and supported by a part-time research facilitator to be hired from our sessional lecturer pool to continue to examine the integration of teaching and research.

Faculty of Science

There is a significant incorporation of undergraduate students in research programs across all disciplines in Science. There are a large number of courses in all departments that include either independent research projects, data collection/analysis, oral presentations of results, or written research reports. In particular, many of the honours and specialization programs in the Faculty either require or encourage students to take on final year thesis or independent research projects. There are also a number of field schools run through the Faculty for students to gain hands-on experience in the field, particularly in Biological Sciences and Earth and Atmospheric Sciences. The Faculty hosted more than 160 summer research students in 2003, paid by individual faculty member's grants or through NSERC studentships. There are also a number of internship opportunities available allowing students to receive a practical research experience. Several internal and external research days and conferences are held each year in all departments encouraging undergraduate student presentations and participation. There are a number of research collections (both library and museum collections) that are available for undergraduate students because of the research programs of the Faculty. As well, there are a large number of research laboratories and equipment that undergraduate students use as part of their programs that would not be available if not for the research programs of the Faculty.

V. Next Steps

In reflecting on the environmental scan of the faculties and the initial recommendations, the members of the Working Group on Teaching and Research stress a number of points. First, members emphasize their surprise at the impressive volume of activities being undertaken by faculties and departments across campus to connect teaching and research for undergraduate students, and by the diversity of the various activities. Second, members express their concern that these activities are not well promoted or shared across campus. Third, members note the issue of connecting teaching and research is not foremost on the minds of the campus community. Fourth, members stressed the importance of recognizing and supporting the diverse nature of research across campus. Fifth, members believe the U of A is changing (there are 1000 new faculty on campus in the past ten years, and while no one wants to lose the momentum we have gained in research, now is the time to change the attitudes on campus with respect to the importance of integrating research into the undergraduate student learning environment).

The initiative of connecting teaching and research on campus must remain sustainable and at the fore of campus discussions in the development of a new Academic Plan and Strategic Business Plan. For this to occur, there must be a continued commitment from central administration, and from the GFC committees with the responsibility for the undergraduate learning environment, to

invest the necessary resources to implement some or all of the recommendations laid out in this report and the commitment to strengthen the connection of teaching and research on campus.

The Report of the Working Group is intended as a discussion document to engage the campus community in the debate about connecting teaching and research as part of the undergraduate learning environment. The report will be tabled with the GFC Committee on the Learning Environment for discussion and presented to the Provost and Vice-President (Academic) and the Vice-President (Research) for information. It is hoped the environmental scan of the faculties, as well as the recommendations of the Working Group, will form the basis for ongoing discussion of the undergraduate learning environment as the university develops a new Academic Plan and Strategic Business Plan. The Working Group has purposefully omitted any estimates of costs associated with any of the recommendations and all of the recommendations presented herein would require more analysis before implementing them across campus.

The Report of the Working Group is also intended to form the basis of ongoing discussions of the connection between teaching and research with the Students' Union, the Graduate Students' Association, and the Association of Academic Staff.

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